Original instructions

AVANTI SERVICE LIFT

User's, Installation and Maintenance Manual

Model Service Lift OCTOPUS

CERTIFICATE

EC Type Examination

EC-Directive 2006/42/EC, Article 12, Section 3b
Machinery

Number of registration: 01/205/0833/13

Certification body for machinery NB0035
at TÜV Rheinland Industrie Service GmbH
herewith confirms for the company

AVANTI WIND SYSTEMS A/S
Høgevej 19
DK- 3400 Hillerød
Denmark

the close conformity of the product

Service lift inside wind turbine systems

Technical data:

Service lift:	**Octopus**	
	L80	L95
- max. load capacity:	240 kg / 2 persons	
- traction hoist:	M508	
- fall arrest device:	ASL508	
- lifting speed:	18 m/min	
- protection fences:	1.10 m	
- fence Interlock system:	Trapped-key system	
- max. distance between brackets:	2240 mm	
- net weight:	180 kg	190 kg
- max. total travel height:	135 m	125 m
- dimensions of cabin (W x D x H):	800 x 1040 x 2680 mm	950 x 1040 x 2680 mm

Examination place: Zaragosa, Spain

with the requirements according to annex I of Directive 2006/42/EC about machinery and amending the Directive 95/16/EC of the European Parliament and the Council from May 2006 for adaptation of legal and administration regulations of the member countries regarding safety of machinery.

The verification was proved by EC-type approval test, Test-Report- No.: 13_021-1 from 2013-04-29 and is valid only duly considering the requirements mentioned in this document.

This certificate is valid until 2018-05-13

Cologne, 2013-05-13

TÜVRheinland® 0035 Notified Body

Certification body
Notified under No. 0035
certifier

Dipl.-Ing. Walter Ringhausen

TÜV Rheinland Industrie Service GmbH
Alboinstraße 56, 12103 Berlin
Telefon +49 (0)30 75 62 – 1557, Fax +49 (0)30 75 62 – 13 70

TÜVRheinland®
Precisely Right.

Date of publication:
1st CE Edition: 6/2013
Revision 3: 12/06/14

Manufacturer:
AVANTI Wind Systems A/S
Rønnevangs Allé 6
3400 Hillerød Denmark
P: +45 4824 9024
F: +45 4824 9124
E: info@avanti-online.com
I: www.avanti-online.com

Sales & Service:

Australia	Avanti Wind Systems PTY LTD	P: +61 (0) 7 3902 1445
China	Avanti Wind Systems	P: +86 21 5785 8811
Denmark	Avanti Wind Systems A/S	P: +45 4824 9024
Germany	Avanti Wind Systems GmbH	P: +49 (0) 41 21-7 88 85 – 0
Spain	Avanti Wind Systems SL	P: +34 976 149 524
UK	Avanti Wind Systems Limited	P: +44 0 1706 356 442
USA	Avanti Wind Systems, Inc	P: +1 (262) 641-9101
India	Avanti Wind Systems, PL	P: +91 44 6455 5911
Brazil	Avanti Brazil Sistemas Eólicos. S.L.	P: +55 85 9671 6336

Manufactured Under Process Patent NO.8,499,896.
® Registered in Europe

Contents

Page

1. Limited warranty 6

2. Introduction 7
   2.1 Observations 7
   2.2 Symbols 7
   2.3 Cautions 8

3. Description 9
   3.1 Purpose 9
   3.2 Scope 9
   3.3 Exclusions 9
   3.4 Technical specifications 10
   3.5 Dimensions 11
   3.6 Components 12
      3.6.1 Overview 12
      3.6.2 Traction hoist 13
      3.6.3 Fall arrest device 13
      3.6.4 Guiding system 13
      3.6.5 Main control box 14
      3.6.6 Cabin control box 14
      3.6.7 Safety switches 15
      3.6.8 Platform fences 15
      3.6.9 Main service lift door 15
      3.6.10 Ladder access door 16
      3.6.11 Maintenance cover 16
      3.6.12 Bottom hatches 16
      3.6.13 Top hatches 16
      3.6.14 Bottom obstruction device 16
      3.6.15 Top obstruction device 17
      3.6.16 Top normal limit switch 17
      3.6.17 Manual descent system 17
      3.6.18 Overload limiter 17
      3.6.19 Internal light 17
      3.6.20 Warning lights 17
      3.6.21 Anchor points 18
      3.6.22 Rescue pendant control 18
      3.6.23 Information signs and documents 19
      3.6.24 Travelling cable pulley 19

4. Installation 20
   4.1 WTG integration requirements 20
   4.2 Preassembly by the WTG manufacturer 20
   4.3 Cautions 21
   4.4 Top beam 21
   4.5 Electrical connections on site 21
   4.6 Travelling cable 21
   4.7 Traction wire rope 21
   4.8 Safety wire rope 22
   4.9 Travelling cable pulley 22
   4.10 Activation plates 22
   4.11 Inspection before first use 22
   4.12 Disassembling 22

5. Instructions for use 23
5.1 Prohibited uses 23
5.2 Normal use 23
5.3 Send function 23
5.4 Enter and exit cabin through door 23
5.5 Emergency stop button 23
5.6 Fall arrest device 23
5.7 Manual descent 24
5.8 Out of service 24

6. Maintenance 25
6.1 Planning 25
6.2 Cautions 25
6.3 Daily inspection procedure 25
6.4 Annual inspection 25
6.4.1 Annual inspection procedure 25
6.4.2 Air gap between brake and disc 26
6.4.3 Common damages on wire ropes 26
6.4.4 Overload test 26
6.5 Spare parts 26
6.6 Troubleshooting 27

Appendix A: Regulation of overload limiter 29
Appendix B: Safety measures 33
Appendix C: Inspection checklist 34
Appendix D: Operation log sheet 35
Appendix E: AVANTI service lift anchor 36
Appendix F: Service tool kit 40

1. Limited Warranty

Avanti Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard AVANTI warranty, the Product[1)] described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of Avanti under this limited warranty, shall be, at the option of Avanti, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to Avanti, freight and insurance prepaid. The obligations of Avanti are expressly conditioned upon return of the Product in strict accordance with the return procedures of Avanti.

This warranty does not apply if the Product (i) has been altered without the authorization of Avanti or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from Avanti; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by Avanti to Customer without charge; or (v) has been sold on an “AS-IS” basis.
Except as specifically set forth in this Limited Warranty,

ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.

This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall

* Avanti service lift (“Product”)

2. Introduction

2.1 Observations

Only trained people may use this lift.
This manual must be available to staff at all times during installation, maintenance and operation.
Additional copies are available from the manufacturer upon request.
All measurements are indicative only and subject to change without notice.

The pictures and sketches in this manual may not reflect the product aesthetics, colours, arrangement precisely. This has no impact on the function or safety.

2.2 Symbols

Symbol	Signal word	Meaning	Possible injury if not observed
Safety instructions			
	DANGER!	IMMEDIATE or possibly imminent danger:	Death or severe injury!
	DANGER!	IMMEDIATE or possibly imminent danger of hazardous voltage:	Death or severe injury!
	CAUTION!	Potentially hazardous situation:	Light injury or material damage.
Additional instructions			
	ATTENTION!	Potentially dangerous situation:	Damage to equipment or workplace
	IMPORTANT!	Useful tips for optimum working procedure	None
Order			
		Reference to written specification/documentation	

2.3 Cautions

Installation and/or maintenance and/or operation of the service lift and its suspension may be performed only by qualified personnel, hired by the employer for the job at hand.

The personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard and slider) at all times.

A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

If more than one person is entrusted with one of the above tasks, the employer shall appoint a supervisor in charge of the operation.

Electrical connection of the system must be made in accordance with EN 60204-1.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!

If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

All tests/repairs of electrical installations may only be performed by qualified electricians.

All repairs to the traction, braking and supporting systems may only be performed by qualified installers.

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by an expert.

Only original fault-free parts may be used.

Use of non-original parts will render the manufacturer's warranty void and any type approval invalid.

No modification, extension or reconstruction of the service lift is allowed without the manufacturer's prior written consent.

No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

Before using the lift an inspection by the authorized inspection organisation must be carried out.

Service lift must be inspected at least once a year by an expert trained by AVANTI. In case of high operating frequency or severe conditions of use, more frequent inspection is required.

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/year (250 h in total).

Service lift may not be used by persons who are under the influence of alcohol or drugs which may jeopardize working safety.

Service lift shall ONLY be used when the turbine is not generating power.

All wind farm site specific rules must be followed. Service lift shall not be used during inclement weather, including wind speeds over 18 m/s.

Avoid injury – follow all instructions!

The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.

3. Description

3.1 Purpose

The service lift purpose is to transport persons plus their tools and equipment to the most convenient height for performing work in wind turbine generators (WTG).

Its use is limited to authorized personnel by AVANTI holding the relevant training certificates. The access to the WTG and consequently to the service lift is controlled and forbidden to public access.

The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point). It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

3.2 Scope

The Octopus service lift system consists of the following subsystems:

- Cabin.
- Traction and fall arrest systems.
- Guiding system.
- Control, safety and power systems (including an interlock system on platform fence doors).
- A rescue pendant control (only mandatory if rescue route of service lift can be somehow blocked).

Each of the subsystems listed above and their components are described in detail throughout the document.

The system fully complies with essential health and safety requirements of European Machinery directive.

There are two versions, L80 and L95, which differ in size. Additionally, there are two different configurations for working temperature ranges; in particular, there is a standard configuration and a low temperature configuration where traction system and main control box components are chosen specifically.

3.3 Exclusions

The service lift shall not be used outdoor or in potentially explosive atmospheres.
The service lift is not designed to carry a person on its top, unless service tool kit is installed.

The wind turbine manufacturer is responsible of integrating the service lift and ensuring compliance with the essential health and safety requirements as stated on the 2006/42/EC Machinery Directive and the applicable harmonized standards following the manufacturer recommendations.

This will require supply of interface components, including but not limited to:

- Ladder system.
- Brackets for ladder sections.
- Platform fences with doors.
- Power supply protection.

The wind turbine manufacturer shall also provide any additional relevant warning, instruction and / or training specific to the integration of the service lift necessary for its safe and correct installation.

Tower manufacturer's risk assessment shall include a service lift integration study.

3.4 Technical specifications

Service lift	
Main door type	Full sliding door
Main door interlock system	Guard locking
Service lift speed	18 m / min ± 20 %
Rated load	240kg
Max. nº persons	2 persons
Max. travelling height (L95)	125 m
Max. travelling height (L80)	135 m
Operating temp (normal version)	-15ºC to +60ºC
Survival temperature (normal version)	-25ºC to +80ºC
Operating temp (Low temp version)	-30ºC to +40ºC
Max. noise level	80 dB (A)

Traction hoist	
Model	M508
Rated load	500 kg
Centrifugal brake speed limiter	Yes
Unit weight	40 kg
Dimensions	266 x 300 x 61 mm
Vertical speed under operation	18 m / min ± 20 %
Power (50 Hz)	1.5 kW
Power (60 Hz)	1.8 kW
Rated current (400V / 690V, 50 Hz)	4.1 A / 2.3 A
Rated current (400 V / 480 V / 690 V, 60 Hz)	4.9 A / 4.1 A / 2.8 A
Start current (400V / 690V, 50 Hz)	13 A / 8.1 A
Start current (400V / 690V, 60 Hz)	15.5 A / 9.8 A
Traction hoist IP protection	IP 55

Fall arrest device	
Model	ASL508
Lifting capacity	500 kg
Max. wire rope speed	30 m / min
Unit weight	7 kg

Traction and safety wire ropes	
Diameter	8.4 mm 5 x 19
Min. breaking load limit	55 KN
Surface treatment	HDG
Weight	0.27 kg / m
Top beam fastenings	2 Ton shackles (C shape)

Cabin dimensions	
L95 Cabin weight	200 kg
L80 Cabin weight	192 kg
Distance from the rung center to the cabin outer edge	970 mm
Cabin width	950 mm for L95 800 mm for L80
Total height	2930 mm
Free standing height inside cabin	2100 mm
Door opening (full) (W x H)	500 x 2100 mm
Min. Emergency exit free pass dimen.	500 x 500 mm

Power supply		
Power supply type		3 Phase + PE + N
Power supply (50 Hz)	**Voltage**	400V / 690V ± 5 %
	Power	1.5 kW
	Rated current	4.1 A / 2.3 A
Power supply (60 Hz)	**Voltage**	400 V / 480 V / 690 V ± 5 %
	Power	1.8 kW
	Rated current	4.9 A / 4.1 A / 2.8 A
Control voltage		24 V (AC)
Fuse		16 A
Control boxes IP protection		IP 65

Travelling cable	
Nominal cross-section	5 G 1.5
Travelling cable type	Intended for use in WTG
Travelling cable weight (approx.)	0.18 kg / m
Travelling cable minimum breaking strength	1500 N
Socket type	To be agreed with customer

Ladder requirements [1]	
Ladder width for Octopus L80	520 mm [1]
Ladder width for Octopus L95	490 mm [1]
Profile dimensions	74 x 25 mm
Max. distance between brackets	2240 mm
Maximum ladder angle with vertical	± 2°
Maximum angle variation	± 1°

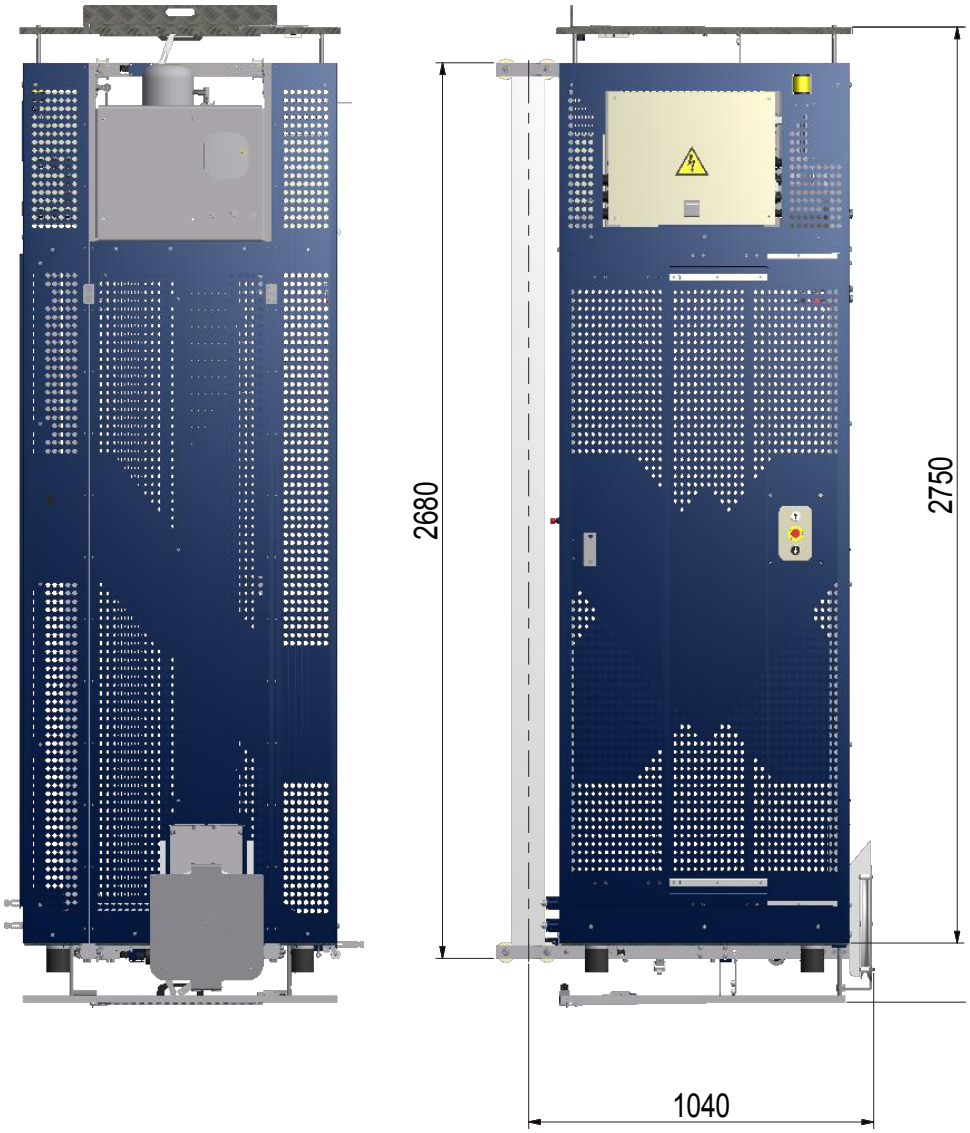
[1] Other dimensions are possible upon request and design verification by AVANTI.

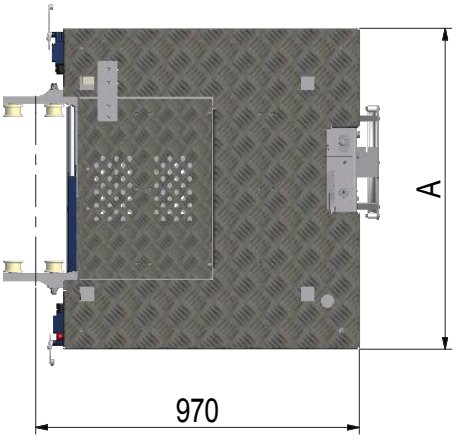
Service tool kit	
Service tool kit weight	<25 kg
Service lift rated load when service tool kit installed	215 kg

3.5 Dimensions

There are two standard sizes:

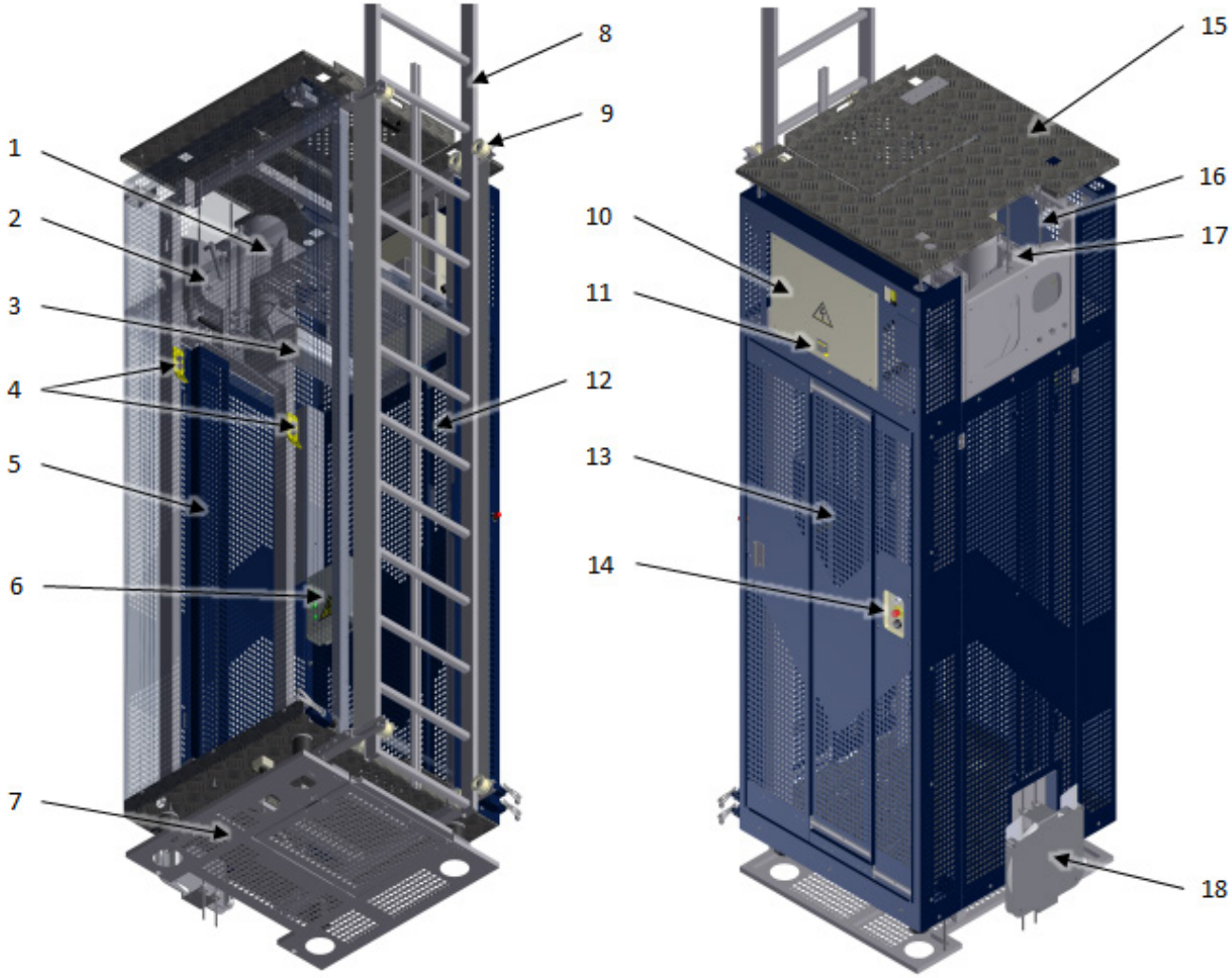
- L95, A = 950 mm
- L80, A = 800 mm





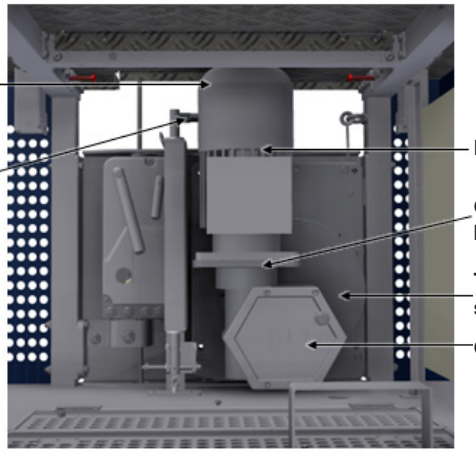
3.6 Components

3.6.1 Overview



1 Traction system
2 Fall arrest device
3 Cabin light
4 Anchor points
5 Maintenance cover
6 Cabin control box
7 Bottom obstruction device
8 Guide ladder
9 Guiding rollers
10 Main control box
11 Hour counter
12 Ladder access door
13 Full sliding door
14 External controls
15 Top obstruction device
16 Safety wire rope
17 Traction wire rope
18 Travelling cable pulley

3.6.2 Traction hoist



The service lift is powered up and down along the traction wire rope by means of an electrical powered hoist.

It features a motor, a gearbox and a traction system. The motor is equipped with a motor overheat limiter and an electromagnetic motor brake.

! *Reliability, endurance and safety of this hoist are only possible with the use of AVANTI approved wire ropes.*

It is largely maintenance free.

3.6.3 Fall arrest device

The service lift is provided with a fall arrest device which will be triggered in case of an overspeed condition. The speed of the safety wire rope passing through the device is continuously monitored, and the jaws automatically close in the event of sudden excessive speed.

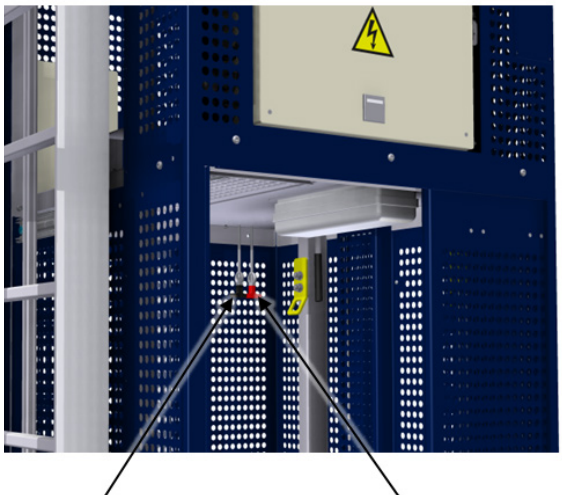
This device protects the service lift against traction wire rope breakages or traction system failures.

The fall arrest device can also be engaged manually in an emergency by pulling the red locking knob downwards.

To release the fall arrest device, pull the black unlocking knob downwards.

STOP *Tightness of safety wire rope must be frequently inspected to ensure full functionality of fall arrest device!*

It is largely maintenance free.

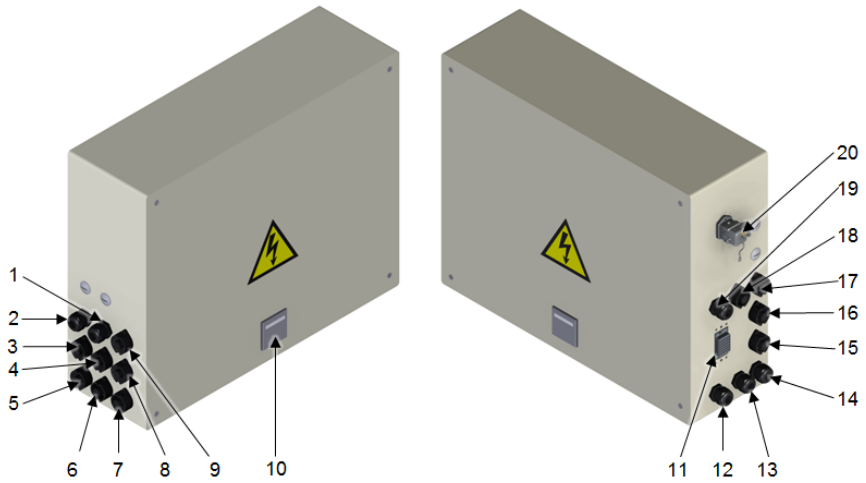


3.6.4 Guiding system

The service lift is safely guided along ladder stiles by means of guiding rollers.

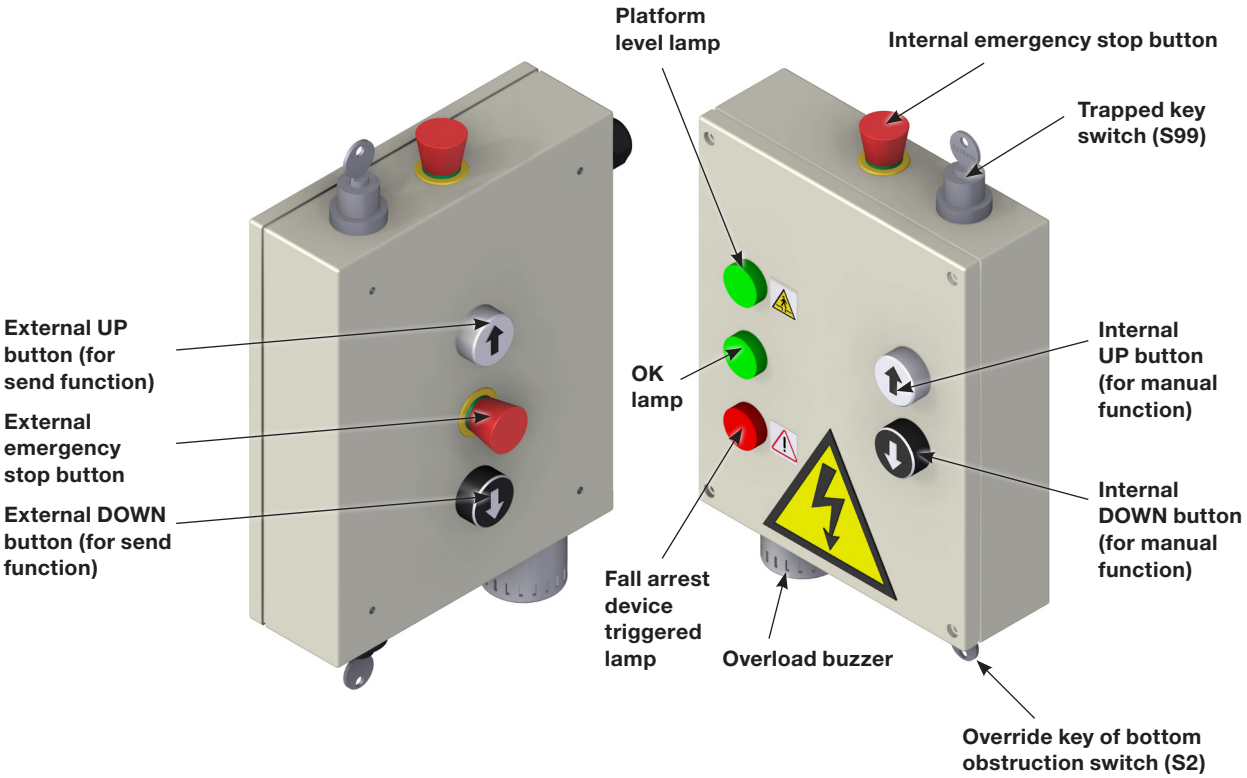
! *Ladder dimensions shall be compatible with guiding rollers.*

3.6.5 Main control box

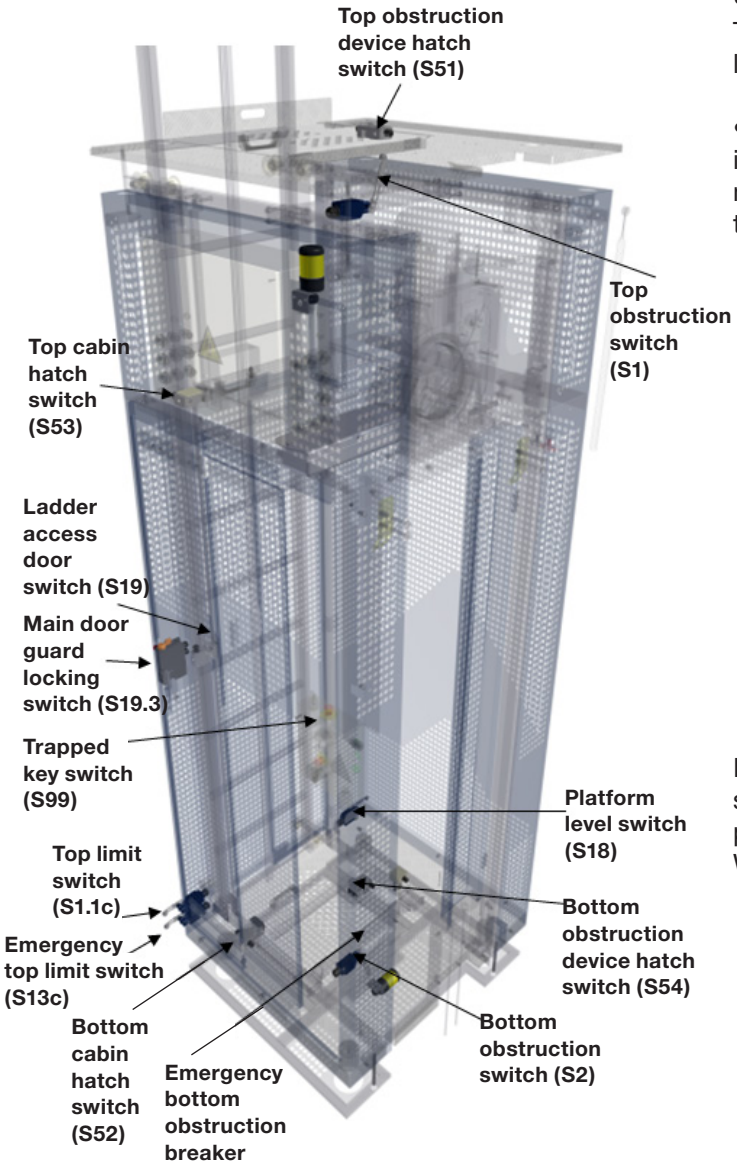


1 Rescue control attachment box socket
2 Top hatch switch (S53) socket
3 Top limit switch (S1.1c) socket
4 Emergency top limit switch (S13c) socket
5 Ladder access door switch (S19) socket
Main door guard locking switch (S19.3) & platform level switch (S18) socket
7 Bottom obstruction switch (S2) socket
8 Bottom hatches switches (S52 & S54) socket
9 Bottom warning light socket
10 Hour counter
11 Cabin control box socket
12 Power supply socket
13 Motor supply socket
14 Motor signals socket
15 Fall arrest device socket
16 Internal light socket
17 Top hatch switch (S51) socket
18 Top limit switch (S1) socket
19 Top warning light socket
20 Service control box socket

3.6.6 Cabin control box


Platform level lamp
Internal emergency stop button
Trapped key switch (S99)
External UP button (for send function)
External emergency stop button
External DOWN button (for send function)
OK lamp
Internal UP button (for manual function)
Internal DOWN button (for manual function)
Fall arrest device triggered lamp
Overload buzzer
Override key of bottom obstruction switch (S2)

3.6.7 Safety switches


Top obstruction device hatch switch (S51)
Top obstruction switch (S1)
Top cabin hatch switch (S53)
Ladder access door switch (S19)
Main door guard locking switch (S19.3)
Trapped key switch (S99)
Platform level switch (S18)
Top limit switch (S1.1c)
Bottom obstruction device hatch switch (S54)
Emergency top limit switch (S13c)
Bottom cabin hatch switch (S52)
Emergency bottom obstruction breaker
Bottom obstruction switch (S2)

3.6.8 Platform fences

They must conform to EN 14122, be 1,1 m high and be equipped with doors. These must be monitored with a trapped key system that permits fence door to be opened only when service lift is present.
Trapped key is attached to cabin by means of a wire rope, preventing loss of key.

In case service tool kit is provided, platform fences of intermediate and top platforms feature nonslip surfaces.

3.6.9 Main service lift door

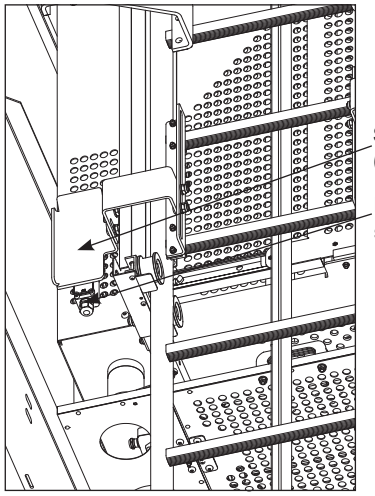
Main access to the cabin is done through the full sliding door installed on the front.

The full sliding door opening dimensions are 2100 x 500 mm.

It features a guard locking system that:

- Prevents service lift to travel if the door is open. This opening condition is monitored by the guard locking switch (S19.3).

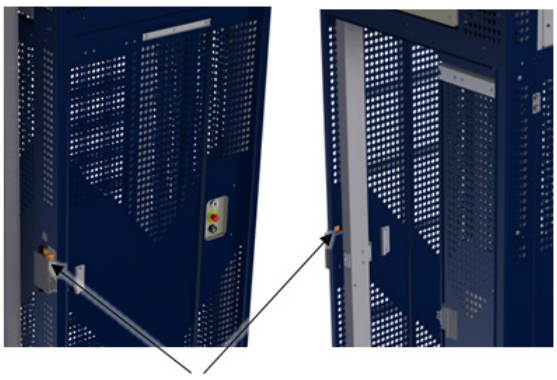
- Permits door to be opened only when service lift is levelled with a platform. This levelling condition is monitored by the platform level switch (S18) which is triggered by the safe zone plates.



It is possible to manually release guard locking system in order to open main door between platforms for maintenance tasks or installation of WTG parts.

External manual release of guard locking of L95

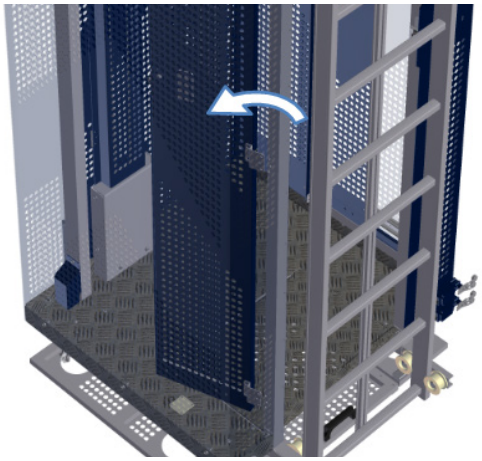
Internal manual release of guard locking of L95



Manual release of guard locking of L80 (accessible from outside and inside)

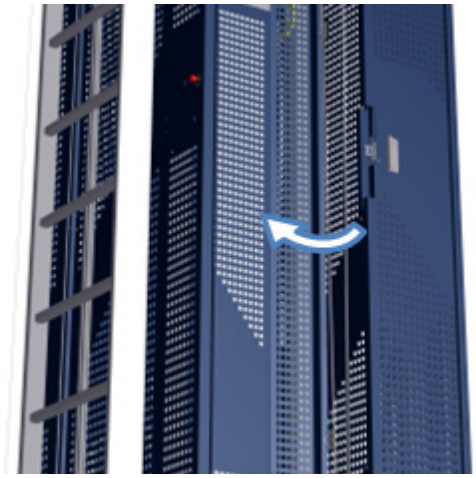
3.6.10 Ladder access door

Ladder access door consists of two hinged sheets that fold up when opened, thus optimizing space.
In case of evacuation, the ladder access door permits direct access to ladder and ladder rail.
A safety switch interrupts control when door is open.



3.6.11 Maintenance cover

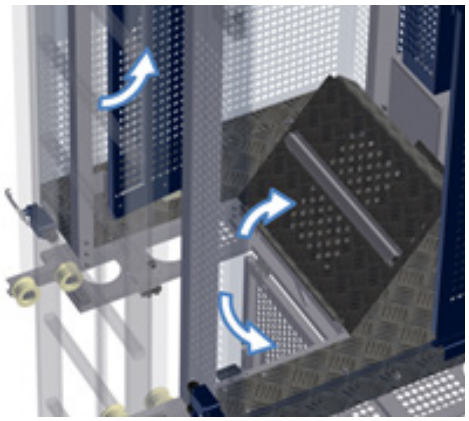
Maintenance cover allows safe and fast inspection of traction and safety wire ropes from inside the cabin while travelling.



3.6.12 Bottom hatches

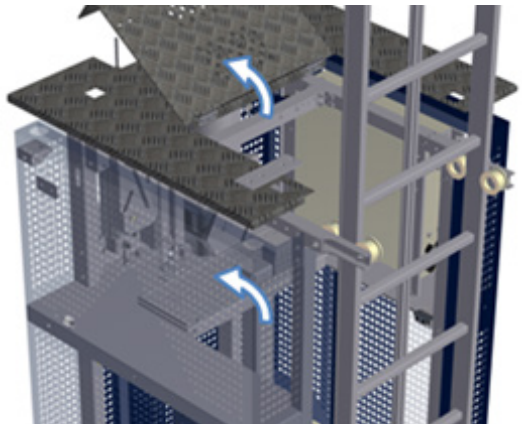
Bottom hatches can be opened from both sides, thus allowing egress and ingress from underneath.
Bottom cabin hatch opens inwards, and bottom obstruction device hatch opens outwards.
Each of them has a safety switch that interrupts control when hatch is opened.
Once top hatches and ladder access door are open, clear area is at least 500 x 500 mm, and ladder becomes totally accessible.

Direct evacuation to ladder is possible at any position along the WTG.



3.6.13 Top hatches

Top hatches can be opened from both sides, thus allowing egress and ingress from above.
Each of them has a safety switch that interrupts control when hatch is opened.
Top cabin hatch consists of two hinged sheets that fold up when opened, thus optimizing space.
Top obstruction device hatch opens outwards.
Once top hatches and ladder access door are open, clear area is at least 500 x 500 mm, and ladder becomes totally accessible.



3.6.14 Bottom obstruction device

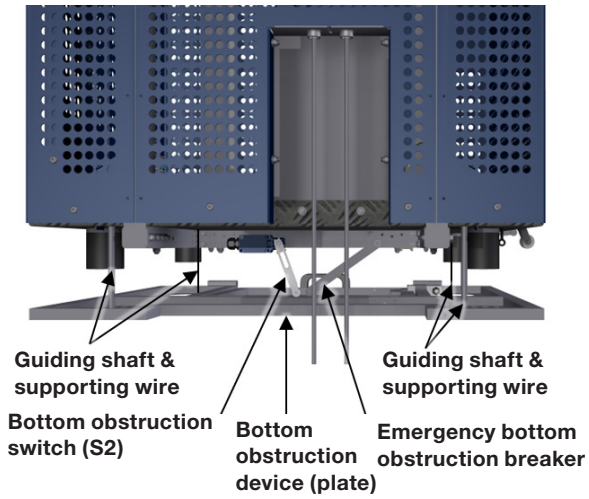
Bottom obstruction device interrupts descent if:

- It encounters an obstacle.
- It reaches the bottom platform.

Ascent will still be possible, for instance to remove the obstacle. In order to put the service lift on the ground, the contact plate functionality can be bypassed with the override bottom obstruction device switch located on the cabin control box. To do so, turn the override bottom obstruction switch key while pressing the down button.

Release the DOWN button as soon as the rubber bumpers hit the floor. Otherwise the service lift or the installation may get damaged.

An emergency bottom obstruction breaker permits the bottom obstruction device to be still operational during manual descent. Manual descent will be stopped if an obstacle is encountered.

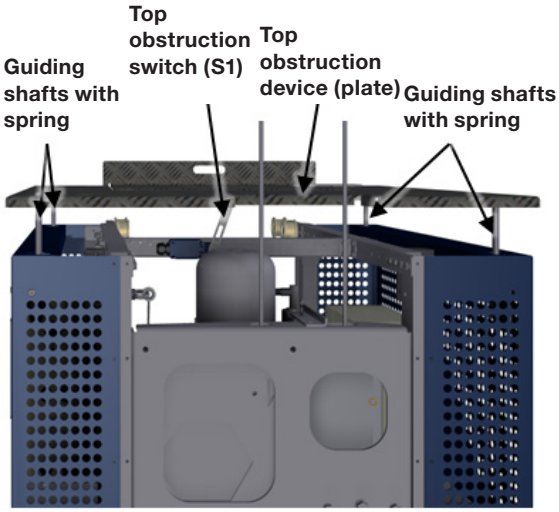

Guiding shaft & supporting wire
Bottom obstruction switch (S2)
Bottom obstruction device (plate)
Guiding shaft & supporting wire
Emergency bottom obstruction breaker

3.6.15 Top obstruction device

Top obstruction device interrupts ascent if it encounters an obstacle. Descent will still be possible, for instance to remove the obstacle.

When the top obstruction device switch (S1) is engaged, press the down button until it disengages.

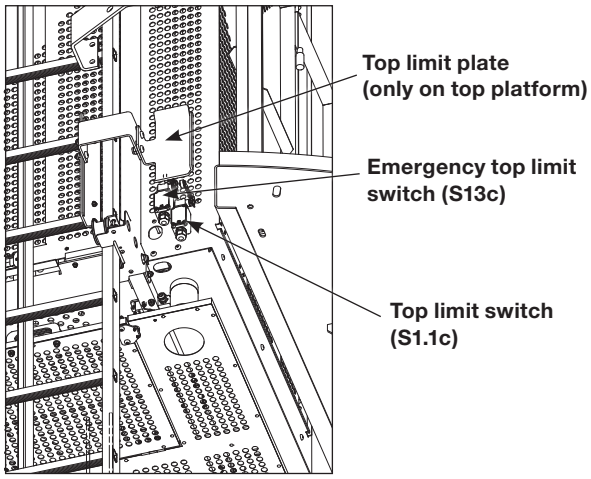
Do not use the service lift until the top obstruction device switch (S1) fault has been rectified.



3.6.16 Top limit switch

Top limit switch (S1.1c) interrupts ascent if it is triggered by the top plate.
Emergency top limit switch (S13c) is triggered in case the top limit switch fails to engage. It cuts off power supply, so only manual descent will be possible.

Top limit plate is mounted on the ladder.



3.6.17 Manual descent system

The service lift features a manual descent system that can be used in case of emergency.

To activate it, push the manual descent actuator upwards. The electromagnetic motor brake is released.
The service lift descends with a controlled speed limited by means of a centrifugal brake installed between the motor shaft and the gear box.

3.6.18 Overload limiter

An overload limiter is built into the traction hoist. In case of an overload, it will prevent any movement of the service lift (by interrupting control) and a buzzer will sound, until overload condition is eliminated.

STOP

Attempting to run an overloaded service lift is prohibited!

3.6.19 Internal light

The service lift is equipped with a light inside the cabin. When service lift is connected to power supply, this light illuminates at all times.

The internal light is battery packed in order to illuminate the inside of the cabin in case of a power failure. When fully charged, it will last at least for 30 minutes.

3.6.20 Warning lights

A set of warning lights is mounted on the top and on the bottom of the service lift. The flashes warn that the service lift is moving.

3.6.21 Anchor points

The service lift features two anchor points inside the cabin.

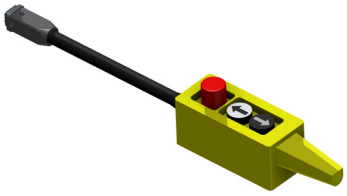
Each anchor point may only be used by one user simultaneously.

During operation personnel shall hook themselves up to the anchor points inside the cabin, in order to prevent falling risks. In case of need of evacuation, the evacuation procedure will be followed.

3.6.22 Rescue pendant control

Rescue pendant control is only mandatory if rescue route of service lift can be somehow blocked. A blocked rescue route is an event where:

- A person is unconscious inside the service lift, blocking the bottom hatch,
- the rescuer is below service lift, and
- the service lift is stopped halfway through a platform hole, blocking rescue route since platform has no extra hatch.



There shall be one rescue pendant control per WTG; and it shall be stored in the WTG bottom platform. A clearly visible sign shall indicate its exact location.

It features three buttons: UP, DOWN and emergency stop button. When necessary, pendant control is plugged to cabin bottom socket. It has a 4 m long cable that permits service lift to be powered up/down that same distance. When plugged, pendant control does not override any safety switch. If any of them is triggered, no running will be possible; including the obstruction device switches (S1 and S2). Therefore, there is no risk of moving service lift hitting rescuer. Pendant control overrides cabin control box, and service control box if installed.

3.6.23 Information signs and documents

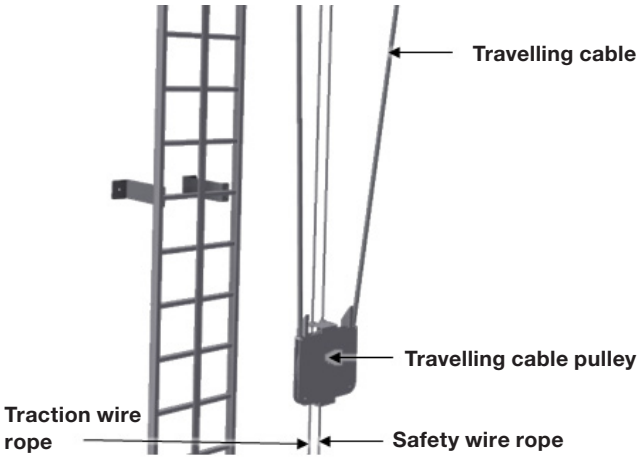
The manual and quick guide are accessible from inside the cabin. The following documents, signs and labels are supplied with the service lift and shall always be available.

A rescue pendant control emergency sign shall be present at the bottom platform, clearly indicating storage location of rescue pendant control.

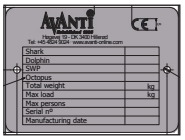
Location	Document
Cabin	Serial number plate
	Manual document inside blue bag
	Quick guide document
	Use of PPE label sign
	Working load limit / N° persons label
	Manual descent label
	Fall arrest deactivation label
	Fall arrest activation label
	Main door guardlocking label
Main control box	Wiring diagram
	No standing on top prohibition label
	Electrical hazard warning label
Bottom platform	Rescue pendant control emergency sign

3.6.24 Travelling cable pulley

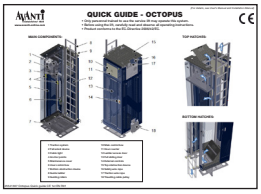
Travelling cable is connected from power supply socket over mid tower´s height platform to service lift socket and it is provided with a cable relief on each end. A travelling cable pulley is suspended on the cable and is guided along the traction and safety wire ropes.



The travelling cable pulley straightens the cable at all times.


Serial number plate

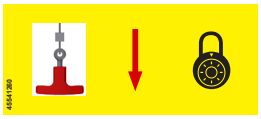
Manual document


Quick guide document

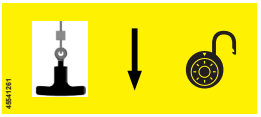
Use of PPE label

Please observe the following safety precautions:
CAUTION!
Only personnel trained to use the service lift may operate the system.
When using the system, bring communication equipment.
Max. 2 persons.
Max. Load: 240 kg.
Bitte folgende Sicherheitsmaßnahmen einhalten:
ACHTUNG!
Nur für Servicelift ausgebildete Personen dürfen diese Anlage bedienen.
Bei Benutzung der Anlage Kommunikationsmittel mitbringen.
Max. 2 personen
Max. Belastung: 240 kg.
Working load limit / N° persons label

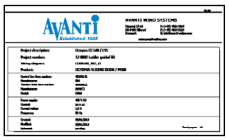
Manual descent label



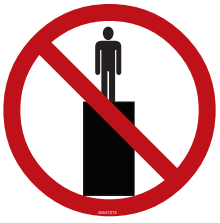
Main door guardlocking label



FAD de/activation labels


Wiring diagram

Electrical hazard warning label


No standing on top prohibition label

Rescue pendant control emergency sign

4 Installation

4.1 WTG integration requirements

WTG component	General integration requirements	
Power supply	Power supply type	3 Phase + PE + N
	Voltage (50 Hz)	400 V / 690 V ± 5 %
	Voltage (60 Hz)	400 V / 480 V / 690 V ± 5 %
	Fuses	16 A
	Protection	Acc. To EN 60204 – 1
	Location of power supply connection for service lift	Over mid tower´s height
Platforms	Distance from rung center to platform outer edge for platforms over mid tower	1035 mm [1)]
	Distance from rung center to platform outer edge for platforms below mid tower	1105 mm [1)]
	Hole width for L95	1070 mm
	Hole width for L80	920 mm
	Minimum clearance around service lift	60 mm
Basement	Minimum height	600 mm [2)]
Platform fences	Height	1.1 m
	Compliant to requirements of standard	EN 14122
	Fence door interlock system	Trapped key system
Safety ladder	Max. total travel height for L95	125 m (typical 140 m tower total height)
	Max. total travel height for L80	135 m (typical 150 m tower total height)
	Max. angle between ladder axis and vertical axis	± 2° [2)]
	Max angle variance between ladder sections	± 1° [2)]
	Max. distance between brackets	2240 mm [2)]
	Forces capable to withstand by ladder brackets	Upon request to AVANTI
	Forces capable to withstand by ladder sections	Upon request to AVANTI
	Ladder width for Octopus L80	520 mm [2)]
	Ladder width for Octopus L95	490 mm [2)]
	Standard stile profile dimensions	74 x 25 mm [2)]
	Rung dimensions	29 x 27 mm [2)]
Top beam	Forces capable to withstand by top beam	Upon request to AVANTI
	Max. thickness of top beam for 2 Tn shackles (C shape)	20 mm
	Min. distance between top platform and top beam shackle holes	3000 mm [2)]

[1)] Depending of travel path, dimension may need to be larger in order to avoid collisions of travelling cable pulley with platforms.
[2)] Other dimensions are possible upon request and design verification by AVANTI.

The WTG manufacturer shall put in place any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI´s scope.

The Octopus service lift is designed for a lifetime of 20 years with a frequency of use of approximately 12.5 h / year or 250 h during life. In case frequency of use is higher, service, inspections and replacement of components might be more often, according to the replacement criteria stated in the maintenance instructions.

4.2 Service lift assembly

4.2.1 After transport

The service lift is transported in parts.
Once at destination, the service lift parts shall be assembled according to assembly drawing AD00067 for L95 and AD00068 for L80.

4.2.2 Before transport

Alternatively, the service lift can be transported already assembled.
Once at destination, the pre-assembled lift shall be extracted from the packaging by means of a crane and the lifting eye bolts.

4.3 Cautions

Prior to installation, ensure that:

- Building sections involved will be able to withstand the service lift loads.
- All parts are available and fully functional.
- Travel zone is protected by fences at each platform.
- Walking way surfaces are dry and not slippery.

The customer must define the maximum allowable wind speed ensuring safe installation.

During installation tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment if falling height is higher than 2 m, hand gloves, helmet, safety glasses, working gear.
- Use a hand winch attachable to the ladder when elevating heavy weights.
- Use a cable clamp or grip when lowering traction and safety wire ropes.
- Not work at different levels if tasks involve risk of falling objects.

Installation shall be performed by AVANTI or trained personnel by AVANTI. At the end of the workday security measures must be taken to put the service lift out of service and make the ladder accessible.

4.4 Service lift installation

The WTG manufacturer shall provide 3D drawings to ensure that installation of lift on ladder is possible.

4.4.1 After tower erection

The service lift is installed on to the ladder after tower erection.

1. Mount safe zone plates, top limit plate and rest platforms on ladder, according to installation drawing ID00112.
2. Fit the nuts and bolts to the shackles, and lock with cotter pins.
3. Mount traction and safety wire ropes (Ø8 mm) using the shackles supplied for the top beam at the top of the tower.
4. Follow instructions from chapter “4.5 Electrical connections on-site” onwards.

4.4.2 Before tower erection

Alternatively, the service lift can be installed on to the ladder before tower erection. With the tower section lying horizontally:

1. Mount safe zone plates, final limit activation plates and rest platforms on ladder, according to installation drawing ID00112.
2. Fit the nuts and bolts to the shackles, and lock with cotter pins.
3. Mount traction and safety wire ropes (Ø8 mm) using the shackles supplied for the top beam at the top of the tower.
4. Attach coiled wire ropes to top beam by means of cable strips to prevent them from moving during transport of tower section.
5. Position service lift on ladder at bottom platform, by means of a crane and the lifting eyes, and according to dimensions of installation drawing ID00112.
6. Mount fixing set for transport to prevent lift from moving during transport of tower section.
7. The tower sections shall be transported to the wind farm.
8. After tower erection takes place, follow instructions from chapter “4.5 Electrical connections on-site” onwards.

4.5 Electrical connections on site

Before making any connection, disconnect any power supply to the service lift and the fence interlock system; and verify with WTG responsible.

The electrical connection of the traction hoist must be made in accordance with EN 60204-1.

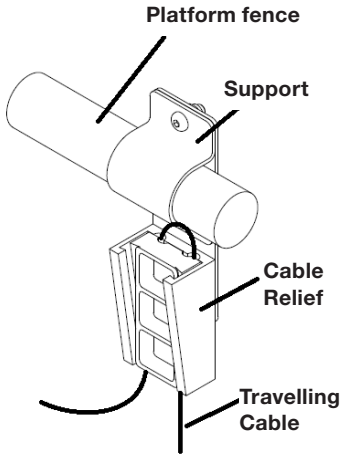
The power supply must be protected by a fuse and against indirect contacts according to local regulations.

Verify that the rated grid and motor voltages are identical.

Electrical system shall be properly insulated.

4.6 Travelling cable

1. Install power supply socket over mid tower´s height platform; and install a cable relief on the platform fence.



2. Feed travelling cable through the cable relief, without plugging it to power supply socket!
3. Uncoil the cable to the bottom platform.

The travelling cable must be evenly uncoiled to prevent looping.

4. Plug travelling cable outlet directly to service lift (provisional connection).
5. Plug travelling cable inlet to power supply socket over mid tower´s height.

4.7 Traction wire rope

1. Uncoil both wire ropes to the bottom of the WTG.

All wire ropes must be evenly uncoiled to prevent looping.

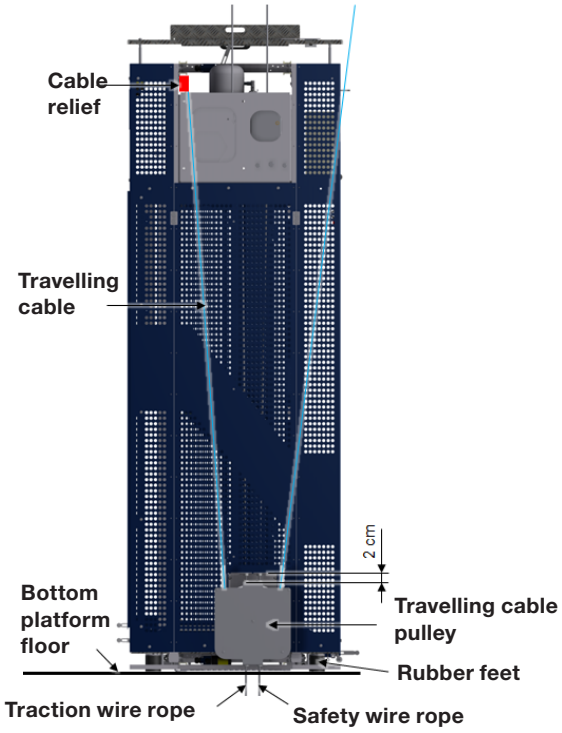
2. Check that traction and safety wire ropes are not crossed.
3. Feed the traction wire rope through the roof into the traction hoist inlet opening.
4. Push the UP button of cabin control box to continue feeding wire rope through until the hoist starts pulling.
5. Open maintenance cover and feed wire rope through guide bushing of service lift.
6. Feed through guide bushing of travelling cable pulley.
7. Feed through the platform hole (see ID00112 for hole´s position).
8. Attach an 11 kg counterweight to it at least 600 mm below the bottom platform.
9. Coil and fasten remaining wire rope with at least 3 cable ties.
10. Check that wire rope and counterweight are able to rotate freely.

4.8 Safety wire rope

1. Feed the safety wire rope through the roof into the fall arrest device inlet opening.
2. Pull the wire rope through while turning the fall arrest device release lever clockwise.
3. Open maintenance cover and feed wire rope through guide bushing of service lift.
4. Feed through guide bushing of travelling cable pulley.
5. Feed through the platform hole (see ID00112 for hole´s position).
6. Feed the wire rope through the compression spring.
7. Fasten cable ties to the compression spring, and adjust them to compress the spring.
8. Pre-tension the safety wire rope by hand as much as possible and fasten the wire lock.
9. Cut the cable ties that keep the spring compressed. The spring will apply a tension of approximately 40 kg to the safety wire rope.

4.9 Travelling cable pulley

1. Turn the override key of bottom obstruction device switch (S2).
2. Manually descend service lift until rubber feet reach bottom platform floor.
3. Unplug travelling cable inlet from power supply socket over mid tower´s height, leaving it attached with the cable relief.
4. Unplug travelling cable outlet from service lift socket.
5. Demount plug head from cable and adjust cable length by cutting off excess.
6. Feed cable through pulley until it is positioned 2 cm from service lift wire rope bushings.
7. Feed cable through cable relief, mount plug and plug it back to service lift.
8. Plug travelling cable inlet from power supply socket over mid tower´s height.



4.10 Safe zone plates and top limit plate

Adjust the final position of the safe zone plate on each platform, so that the service lift floor is levelled with the platform floor when it stops.
Adjust the final position of the top limit plate so that the service lift floor is levelled with the top platform floor when it stops.

4.11 Inspection before first use

A service lift inspector must carry out an inspection before first use following the Annual inspection procedure and filling in the Inspection checklist.

Inspection shall only be carried out by AVANTI, or an authorized person, following the Annual inspection procedure.

And filling in the Inspection checklist for future possible reference.

The WTG owner must ensure that the results of this inspection before first use are logged in the Operation log sheet.

4.12 Disassembling

In accordance with local authority regulations disassemble in reverse order and dispose.

5 Instructions for use

5.1 Prohibited uses

The consequences of not following below prohibitions are extremely hazardous to the physical integrity of the users.

When using the service lift it is prohibited to:

- Use the service lift beyond its intended purpose.
- Operate the service lift without following the safety warnings and operating instructions.
- Overload the service lift more than its rated load.
- Try to repair machine components. Only personnel from AVANTI or competent persons certified by AVANTI are allowed to perform service on the machine.
- To use the ladder while service lift is being used.
- To use the ladder, unless service lift is out of service, or in case of evacuation or rescue.
- To place objects on service lift roof.
- To descent on service lift roof.

5.2 Normal use

1. Connect power supply.
2. Open fence and service lift doors.
3. Enter cabin.
4. Close fence door.
5. Remove trapped key from fence.
6. Close service lift door.
7. Insert trapped key in cabin control box, and turn to ON position.
8. Press and hold UP or DOWN button to travel.
9. After use, disconnect power supply.

5.3 Send function

- Push external DOWN button of cabin control box to send the service lift to bottom platform.
- Push external UP button of cabin control box to send the service lift to top platform.

5.4 Enter and exit cabin through door

1. Hook up your shock absorber to an anchor point every time the service lift door is open.
2. Be aware of tripping risk if service lift floor is not perfectly aligned with platform floor.

5.5 Emergency stop button

1. Press the emergency stop button to interrupt any control function.
2. Pull to reset the control after necessary verifications.

5.6 Fall arrest device

1. Pull the red locking knob downwards to manually engage the fall arrest device in case of an emergency.
2. Pull the black unlocking knob downwards to release the fall arrest device.
3. If the fall arrest device cannot be released, ascend the service lift a few centimetres to remove the load on the safety wire rope.

When a fall is arrested, service lift is exposed to dynamic loads. Inspect and replace damaged wire ropes, wire rope fastenings fall arrest device and guiding system (including ladder).

5.7 Manual descent

Manual descent shall only be done in case it is strictly necessary.

To ensure a safe manual descent, personnel shall use walkie-talkies between them.

1. Verify that the fall arrest device is released.
2. In case it cannot be released, evacuate the service lift following the evacuation procedure.
3. Check that there are no obstacles or persons in the travel zone.
4. Take the manual descent actuator from its holder.
5. Push and hold the manual descent actuator upwards.
6. Position service lift at bottom platform.

5.8 Out of service

1. Secure service lift bringing it all the way down, until bottom normal switch is engaged.
2. Disconnect power supply to prevent inadvertent operation of the service lift.
3. Place a warning sign: SERVICE LIFT OUT OF SERVICE. DO NOT USE.
4. Padlock as necessary.
5. Contact technical service for repair.

6 Maintenance

6.1 Planning

In order to guarantee that the service lift is ready to be used, scheduled inspections shall be carried out.

Before any maintenance operation, check that the service lift is properly out of service.

Frequency	Performed by	Components
Daily	User	Travel zone
		Control and safety devices
Annually	Authorised person by AVANTI	Travel zone
		Control and safety devices
		Cabin
		Traction system
		Fall arrest system
		Overload limiter
		Traction and safety wire ropes
		Guiding system
		Electric system
		Information signs and documents
		Doors and hatches
		Cabin control box
		Safety switches
		Interlock system
		Platforms
		Overall
Every 250 h of use	AVANTI workshop	Traction hoist
		Fall arrest device

In case of a fault, do not use the service lift until it is solved. If required secure workplace.

6.2 Cautions

Before any maintenance task, ensure that walking way surfaces are dry and not slippery.

During maintenance tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment (when falling height is more than 2 m), hand gloves, helmet, safety glasses and working gear.
- Place cabin at bottom platform and disconnect power supply.
- Use an electricity measuring tool when performing inspection of electrical components.
- Use a hand winch attachable to the ladder when handling big/ heavy loads and shall be performed at least by 2 persons.
- Panel parts shall be removed to facilitate access to confined spaces.
- Guiding rollers shall be replaced one by one.
- Use a cable grip when replacing travelling cable.
- Keep cabin doors closed when using a 3-step ladder.
- Dismount hatch to access the engine room.
- Ensure that no one is working above them and secure ladder part against fall with two ropes when replacing a ladder section.

Only qualified technicians shall perform electrical installation tasks.

6.3 Daily inspection procedure

Inspect the travel zone, control and safety devices and control and safety devices of service tool kit, following the instructions of the Inspection checklist.

6.4 Annual inspection

6.4.1 Annual inspection procedure

Scheduled inspection is required every year. Although it may be required more frequently depending on frequency and conditions of use, and local regulations.

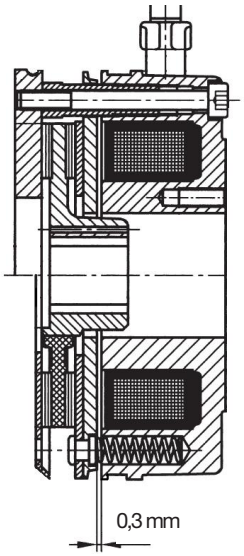
Annual inspection shall only be carried out by AVANTI, or an authorized person, following the Inspection checklist for future possible reference.

During the annual inspection all the components shall be checked to verify that they are mounted correctly, free of damage and that none are missing; in order to guarantee that the service lift can be used safely.

The WTG owner must ensure that the results of all annual and extraordinary inspections and tests are logged in the Operation log sheet.

6.4.2 Air gap between brake and disc

Check that air gap between brake and disc is 0.3 mm, using a thickness gauge.



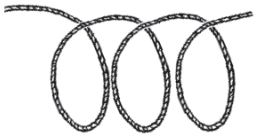
6.4.3 Common damages on wire ropes

Wire ropes shall be inspected as described in EN 12385-3 2004 + A1 2008, including, but not limited to, inspection of following common damages:

Kinks resulting from counterweight of traction wire rope not being able to rotate freely.

8 Wire strand breaks

Reduction of the Wire diameter



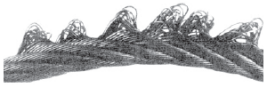
Wire strap/loop, which cannot be unwound

Loop knot forming when a wire loop is pulled tight

Bends resulting from inappropriate treatment (e.g. securing the load with the wire)

Damage resulting from crushing, squeezing, running over, etc.

Wire bags



Loop formation

6.4.4 Overload test

Load the service lift to 125% of its rated load. When an attempt is made to start the hoist, overload limiter should engage and prevent ascent, and the overload buzzer should sound.
In case overload limiter does not engage, follow procedure described in appendix of Regulation of overload limiter.

6.5 Spare parts

Only use original parts. Spare part lists are available from AVANTI upon request. Please, indicate service lift model.

6.6 Troubleshooting

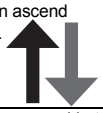
All tests and repairs to the electronic components shall be performed by authorized personnel only!

The wiring diagram is placed in the power cabinet.

Repairs to the traction hoist, the fall arrest device and to the system's supporting components shall be performed by qualified personnel only!

If these steps do not identify the cause and rectify the fault: consult a qualified authorized person or contact the manufacturer.

Breakdown	#	Cause	Specific cause	Solution
The service lift cannot ascend nor descend. Attempting to use the lift will jeopardize work safety.	A1	An emergency stop button has been actuated.	-	Pull button to release it.
	A2	Wire rope loop in traction hoist.	Damaged or defective wire rope or wire rope outlet causes problems.	Stop work immediately. Ask supplier or manufacturer for help.
	A3	The fall arrest device is holding the service lift on the	Traction wire rope breakage. Traction hoist failure.	Evacuate service lift following procedure.
	A4	The service lift is stuck by an obstacle.	-	Carefully remove the obstacle. Test the operational safety of affected WTG and service lift components. Inform the supervisor.
				If obstacle cannot be removed: evacuate service lift. Test the operational safety of affected WTG and service lift components. Inform the supervisor.
	A5	Power failure.	Power supply is disconnected.	Connect power supply.
			Grid voltage interrupted.	Find the cause and wait for the power to return.
			Supply between grid connection and control interrupted.	Test, and repair or replace, connections, wiring and fuses.
			Slack rope sensor1) is engaged. 1)Note: Optional feature. Mandatory for AECO versions.	Test slack rope sensor´s functionality.
	A6	A safety switch is engaged.	Top limit switch (S13c) is activated.	Manually descend service lift until switch is released.
			Main door guard locking switch (S19.3) is activated.	Close door.
			Ladder access door switch (S19) is activated.	Close door.
			A top hatch switch (S51 & S53) is triggered.	Close hatches.
			A bottom hatch switch (S52 & S54) is triggered.	Close hatches.
			Manual descent switch is activated.	Adjust manual descent switch so that it is not involuntarily activated.
	A7	Overheating protection switch is activated.	A phase is missing.	Test, and repair or replace, connections, wiring and fuses.
			Motor is not cooling.	Clean the motor cover.
			Voltage too high/low.	Measure voltage and power consumption on the loaded motor. If voltage deviates from specifications, use cable with increased dimensions.
	A8	Electromagnetic motor brake does not release (no click sounds when UP or DOWN	Power supply failure. Braking coil or rectifier is defective. Braking rotor does not open.	Have an authorized person test, and repair or replace, the traction hoist.
	A9	The trapped key is not present or the trapped key switch is in the OFF position.	-	Insert the key and turn it to the ON position.
	A10	The guard locking switch is not functioning properly.	-	Test, and repair or replace, defective or damaged components.
		Slack rope is engaged.	-	Check the slack rope sensor1) connection/function. Replace if necessary. 1)Note: Optional feature. Mandatory for AECO version.
	A11	Overload buzzer sounds.	Service lift is overloaded!	Reduce load until buzzer stops.
	A12	Two phases are changed in the power supply.	Phase monitor relay interrupts control.	Have an authorized person switch the 2 phases in the plug.
	A13	Rescue pendant control is plugged.	It overrides cabin control box.	Use rescue pendant control in case of rescue event. Otherwise, unplug pendant control.

Breakdown	#	Cause	Specific cause	Solution
Service lift can descend but cannot ascend.	B1	The service lift is stuck with an obstacle over it.	Top obstruction device is engaged.	Carefully move the service lift downwards and remove the obstacle. Test the operational safety of affected WTG and service lift components. Inform the supervisor.
	B2	Top final limit stop switch is activated.	Switch is defective.	Test, and repair or replace, top normal limit switch.
			Service lift has reached upwards travel limit.	-
	B3	A phase is missing.	-	Test fuses and power supply.
	B4	Fault in UP control circuit.	-	Test, and repair or replace, connections, wiring and relays.
Motor hums loudly or wire ropes squeak, but the service lift can ascend and descend. 	C	Wire ropes are dirty. Further use of service lift may result in damage to the traction hoist.	-	Clean wire ropes. Test, and repair or replace, traction hoist at AVANTI.
Service lift can ascend but cannot descend.	D1	The service lift is stuck with an obstacle below it.	Bottom obstruction device is engaged.	Carefully move the service lift upwards and remove the obstacle. Test the operational safety of affected WTG and service lift components. Inform the supervisor.
	D2	The fall arrest device is holding the service lift on the wire rope.	Traction hoist speed is too high.	Ascend service lift to free safety wire rope. Release fall arrest device by pulling black
			Triggering speed of fall arrest device is too low.	A defective fall arrest device will threaten the safety of the service lift! Replace it immediately!
	D3	Fault in DOWN control circuit.	-	Manually descend service lift. Test, and repair or replace, connections, wiring and relays.
		The slack rope sensor is holding the service lift on the traction wire rope.	The device has engaged.	Ascend service lift to disengage the device.
			The device is not properly installed.	Have a competent technician adjust the device correctly.
			The device is defective.	Send device to AVANTI to test, repair or replace.
OK lamp does not illuminate although operation is normal.	E	The OK lamp is defective.	-	Have an authorised person replace it.

Appendix A:
Regulation of overload limiter

Verification and/or adjustment of the overload device on the service lift can only be done by a qualified person, who must have been instructed by AVANTI to perform this task.

Avoid injury by strictly following the instructions!

Required tools/material:
- Security Torx 40.
- Test weights for applying the test load.

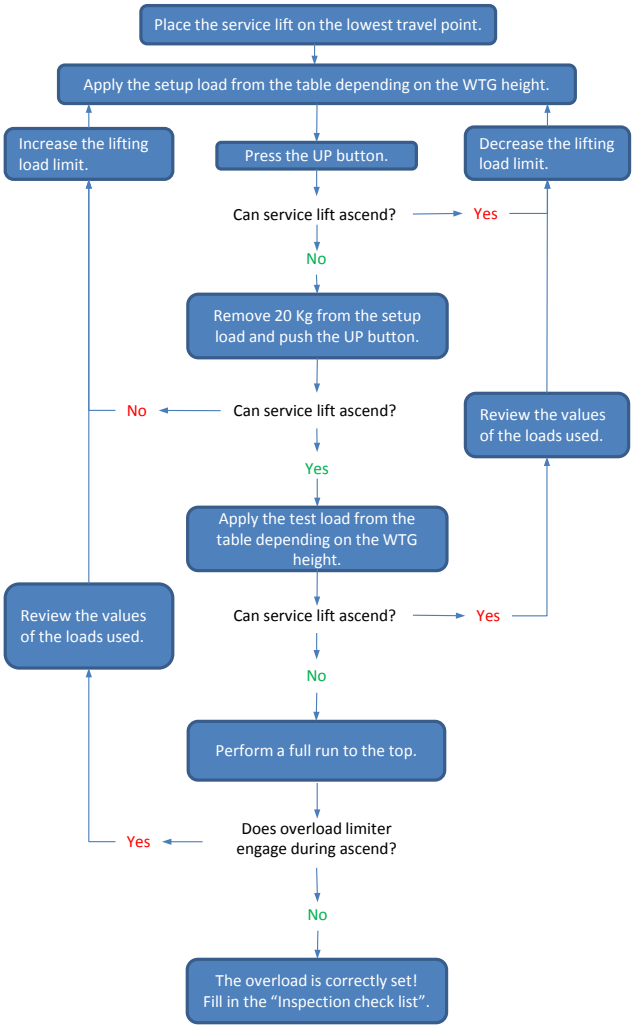
To modify the lifting load limit:
1. Insert the overload adjustment tool in the adjustment screw through the hole as shown in the figure.

Overload adjustment tool.

2. Turn the tool clockwise to increase the lifting load limit.
3. Turn the tool counter-clockwise to decrease the lifting load limit.

One turn on the adjustment screw represents a change of approximately 40 Kg of the lifting load limit.

To adjust the lifting load limit proceed as follows:


Place the service lift on the lowest travel point.
Apply the setup load from the table depending on the WTG height.
Increase the lifting load limit.
Press the UP button.
Decrease the lifting load limit.
Can service lift ascend?
Yes
No
Remove 20 Kg from the setup load and push the UP button.
No
Can service lift ascend?
Review the values of the loads used.
Yes
Apply the test load from the table depending on the WTG height.
Review the values of the loads used.
Can service lift ascend?
Yes
No
Perform a full run to the top.
Yes
Does overload limiter engage during ascend?
No
The overload is correctly set! Fill in the "Inspection check list".

Travel distance	Setup load L95 (kg)	Setup load L80 (kg)	Test load L95 (kg)	Test load L80 (kg)
125 to 135 m	-	325	-	360
115 to 125 m	325	325	355	360
105 to 115 m	320	320	350	355
95 to 105 m	315	315	345	350
85 to 95 m	310	310	340	345
75 to 85 m	310	310	340	345
65 to 75 m	305	305	335	340
55 to 65 m	300	300	330	335

Appendix B: Safety measures

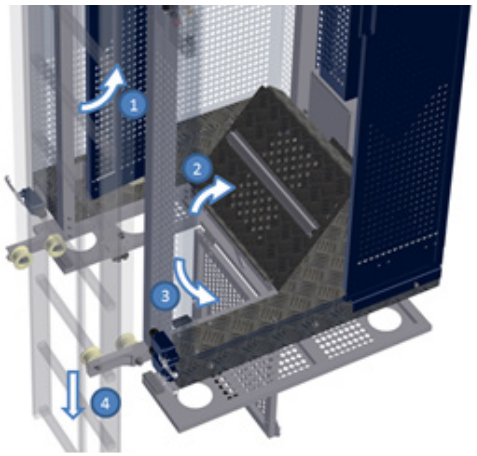
General: The service lift is only to be used by personnel who have received instructions in operating the service lift in all predictable situations. These instructions can only be given by a person with the proper knowledge e.g. Avanti Trainer or Trainer approved by AVANTI.
The following precautions and procedures are to be followed during operation of, and if the service lift stops and the manual emergency descent cannot be performed.

Operating the the service lift: Anyone going in the service lift must at all times wear PPE (safety helmet, full body harness, shock absorber, lanyard and slider that fits ladder safety rail).

Evacuation from the cabin: is only necessary in extreme situations.
If necessary, follow procedure below:

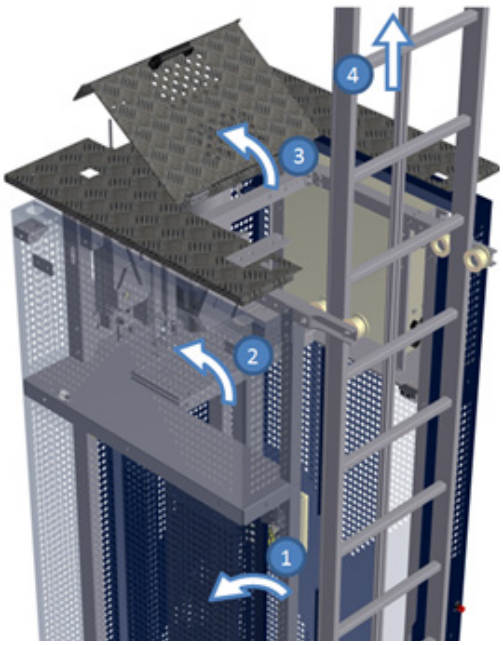
Evacuation through bottom hatches

1. Open ladder access door.
2. Attach slider to ladder rail.
3. Open bottom hatches.
4. Climb out of cabin.



Evacuation through top hatches

1. Open ladder access door.
2. Attach slider to ladder rail.
3. Open top hatches.
4. Climb out of cabin



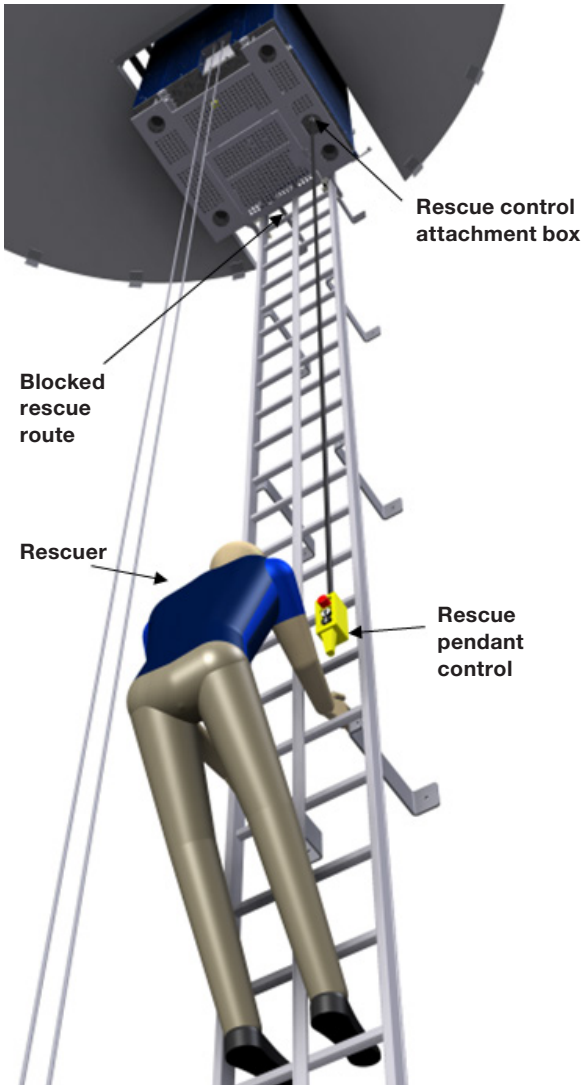
Rescue of service lift: is only necessary in extreme situations. If necessary, follow procedure below:

Rescue with unblocked rescue route

1. Climb safety ladder until you reach service lift.
2. Open hatches.
3. Enter cabin and release slider.
4. Close hatches.
5. Attend casualty.
6. If necessary, descend service lift to bottom platform.

Rescue with blocked rescue route

1. Take the rescue pendant control stored in bottom platform and attach it to your harness by means of a carabiner.
2. Climb safety ladder up to service lift carrying rescue pendant control.
3. Plug the rescue pendant control to rescue control attachment box.
4. Power the service lift 4 m approximately and then climb the ladder that same distance.
5. Repeat previous action until you reach the nearest platform.
6. Climb off the ladder to the platform floor.
7. Level service lift floor 100 mm approximately over platform floor, open fence and service lift doors and attend casualty.
8. Unplug pendant control from rescue control attachment box, so cabin control box is operational again.
9. Store rescue pendant control back in bottom platform.



Appendix C: Inspection checklist

Date:		**Serial nº traction system:**	
Name of competent:		**Serial nº fall arrest device:**	
Lift nº:		**Tower nº:**	
Total hours of operation:		**Address of installation:**	

1	TRAVEL ZONE	OK	Not OK	ISSUE DESCRIPTION
1.1	Travel zone is clear of obstacles.			
2	**CONTROL & SAFETY DEVICES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
2.1	Platform level lamp illuminates when power supply is connected and service lift is levelled with platform.			
2.2	Close doors and hatches and turn trapped key to ON position: OK lamp illuminates and ascent / descent are possible.			
2.3	Press internal emergency stop button: ascent / descent are not possible. Pull button to release: ascent / descent are possible.			
2.4	Press and hold internal UP button: ascent is possible (2 m).			
2.5	Turn orange lever of main door guardlocking as described in label: door can be opened. Counter turn lever: door cannot be opened.			
2.6	Press and hold red button main guarlocking (only for L95): door can be opened. Release button: door cannot be opened.			
2.7	Press and hold internal DOWN button: descent is possible (0.5 m).			
2.8	While OK lamp illuminates, 1st user triggers top limit switch (S1.1c) lever, and 2nd user presses internal UP button: ascent is not possible.			
2.9	While OK lamp illuminates, 1st user triggers emergency top limit switch (S13c) lever, and 2nd user presses internal UP button: ascent is not possible.			
2.10	Press and hold internal DOWN button until bottom obstruction device reaches floor (1.5 m): descent is not possible and OK lamp stops illuminating.			
2.11	When service lift is levelled with platform, main door can be opened.			
2.12	While first user stands on and compresses top obstruction device, second user presses and holds internal UP button: ascent is not possible.			
2.13	Ascend to top platform: wire rope fastenings are free of damages.			
2.14	Descend to bottom platform and record hour counter reading on operation log sheet: It is less than 250 h since last overhaul.			
2.15	Cabin control box is free of damage.			
2.17	All internal buttons of cabin control box are fully functional.			
2.18	All external buttons of cabin control box are fully functional (send function).			
2.19	Bottom obstruction override switch of control box is fully functional.			
2.20	Emergency bottom obstruction breaker functions properly.			
3	**CABIN**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
3.1	Cabin is free of damage and properly assembled.			
3.2	Cabin is clean and in overall good condition.			
3.3	Bottom obstruction device is free of damage, properly installed and fully functional (it compresses and decompresses properly).			
3.4	Top obstruction device is free of damage, properly installed and fully functional (it compresses and decompresses properly).			
3.5	Anchor points are free of damage (without cracks, dents and have no permanent deformation) and properly tightened.			
4	**GUIDING SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
4.1	Outer surface of guiding rollers is uniform and free of damage.			
4.2	Wear of surface of guiding rollers is not be bigger than 1 mm.			
4.3	Guiding rollers are properly installed.			
4.4	Outer diameter of guiding rollers is between 48 and 50 mm.			
4.5	Ladder stiles and fish plates are free of damage and do not have any bumps nor obstacles.			
4.6	Safe zone plates are properly positioned and tightened.			
4.7	Top limit plate is properly positioned and tightened.			
4.8	Guiding ladder is free of damage and properly installed.			
4.9	Bolts of guiding ladder are properly tightened.			
5	**DOORS AND HATCHES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
5.1	Bottom and top hatches are fully functional (open and close properly).			
5.2	Door is properly mounted and tightened.			
5.3	Main service lift door is fully functional (opens and closes properly).			
5.4	Main service lift door guard locking is fully functional (locks and unlocks properly).			
5.5	Main service lift door guard locking is properly mounted and tightened.			

6	ELECTRICAL SYSTEM	OK	Not OK	ISSUE DESCRIPTION
6.1	All electrical cables are free of damage (specially isolation).			
6.2	Electric cables are properly layed and fixed with necessary cable ties.			
6.3	Sealing of control boxes is in order.			
6.4	Internal light illuminates properly with and without power supply (emergency function).			
6.5	Warnings lights function properly.			
6.6	Cable reliefs are properly mounted (cables not loaded at the cable plug).			
7	**TRACTION HOIST**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
7.1	Clean only when very dirty ensuring sufficient air supply.			
7.2	If hour counter reads 250 h since last overhaul, overhaul device at AVANTI workshop and furnish with new certificate.			
7.3	Current matches figure of service lift data plate.			
7.4	All fixing screws and bolts are present and properly tightened.			
7.5	Electromagnetic motor brake: check that air gap between brake and disc is 0.3 mm.			
7.6	There is no trace of oil leak around motor and gearbox.			
7.7	Traction hoist is free of damage (no dents, cracks or similar).			
7.8	The manual descent system functions properly.			
7.9	Manual descent actuator is present and is properly stored.			
7.10	Traction hoist sounds normal during travel.			
8	**FALL ARREST DEVICE**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
8.1	Fall arrest device: no visual defects have appeared.			
8.2	Clean only when very dirty ensuring sufficient air supply.			
8.3	If hour counter reads 250 h since last overhaul, overhaul device at AVANTI workshop and furnish with new certificate.			
8.4	It is well lubricated: using too much oil will not harm the equipment or the gripping function.			
8.5	Fall arrest device engages when performing overspeed "hand test"(safety wire rope is pulled by hand from first platform).			
8.6	The red locking knob engages fall arrest device when pulled down.			
8.7	Power supply is cut off when fall arrest device is engaged.			
8.8	The black unlocking knob releases fall arrest device when pulled down.			
9	**OVERLOAD LIMITER**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
9.1	Perform overload test according to manual.			
9.2	Adjust rated load of overload limiter according to manual.			
9.3	Perform test run with maximum capacity from bottom to top platform.			
10	**TRACTION AND SAFETY WIRE ROPES**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
10.1	They are clean and slightly greasy with a standard multipurpose grease free of disulphide.			
10.2	There are no 8 wire strand breaks or more on a wire rope length corresponding to 30 times the wire rope diameter.			
10.3	There is no severe corrosion on the surface or the inside.			
10.4	There is no heat damage, evident by the wire rope colour.			
10.5	There is no reduction of wire rope diameter by 5% or more compared to nominal wire rope diameter.			
10.6	Wire ropes are free of damages described in common damages on wire ropes.			
11	**WIRE ROPES AT BOTTOM PLATFORM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
11.1	Safety wire rope is properly mounted with a spring according to specific type manual.			
11.2	Safety wire rope is provided with 2 properly tightened wire rope locks.			
11.3	Traction wire rope is mounted with an 11kg counterweight.			
11.4	Traction wire rope is provided with 2 properly tightened wire rope locks beneath the counter weight.			
11.5	Traction wire rope coil and counterweight are free to rotate.			
11.6	Traction and safety wire ropes are properly coiled up and fixed with 3 cable ties each.			
12	**WIRE ROPES AT TOP BEAM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
12.1	Top beam is properly mounted; and properly tightened to WTG, or if welded, its welding is in good condition.			
12.2	Each wire rope is properly mounted with a shackle, a nut and a bolt locked with a cotter pin.			
13	**TRAPPED KEY SYSTEM**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
13.1	Trapped key is properly secured to the cabin with a chain or wire rope.			
13.2	The trapped key lock is properly tightened to the platform fence and fully functional.			
13.3	Trapped key switch of service lift is fully functional.			

14	PLATFORMS	OK	Not OK	ISSUE DESCRIPTION
14.1	Cabin passes freely through all platform openings.			
14.2	Fences of each platform fulfil specifications for proper mounting.			
14.3	Screws and bolts are properly tightened.			
15	**INFORMATION SIGNS AND DOCUMENTS**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
15.1	Verify that all information signs and documents are available and legible.			
16	**FINAL ASSESSMENT**	**OK**	**Not OK**	**ISSUE DESCRIPTION**
16.1	Service lift is in overall good operational condition.			Name of competent(s) in capital letters: Signature of competent(s):

Competent inspection may only be performed by AVANTI or competent person certified by AVANTI.

Every 12 months competent inspection has to be carried out, and the Inspection checklist and Operation log sheet must be completed for possible future reference.

Appendix D: Operation log sheet

Date & time	Type of inspection (before first use, annual or unsched-uled)	Overall result		Hour counter	Issue description & comments	Name (in capital letters)& signature of competent
		OK	Not OK			

Appendix E: AVANTI lift anchor

E.1 Caution

AVANTI LIFT ANCHOR is an anchor point used for protection against falls from heights intended for use with a full body harness approved according to EN 361 or Z359.1:2007 as applicable. Connection to the LIFT ANCHOR is only allowed by using self-closing connectors according to EN 362 or Z359.1:2007 as applicable.

Use in connection with other equipment than specified, may be potentially dangerous. User shall be equipped with a means of limiting the maximum dynamic forces exerted on the user during the arrest of a fall to a maximum of 6kN. In case of doubt, please contact AVANTI.

The maximum load that can be transmitted in service from the anchor device to the structure is 22.2 kN in ±15° vertical direction. The maximum deflection of the anchor point that can occur in service is 10mm.

AVANTI LIFT ANCHOR is tested and approved only to be mounted on AVANTI lifts. This manual always needs to be represented in language of sale and provided for use by all technicians. Activities at height are dangerous and may lead to severe injury or even death.

Gaining an adequate apprenticeship in appropriate techniques and methods of protection is important and is your own responsibility.

Users are obliged to read and understand this User Manual. Further they need to be proper equipped and instructed with the use of the necessary fall arrest equipment and emergency procedures in case of injury or sudden illness.

Users going to install AVANTI LIFT ANCHOR need to be familiar with the installation section of this manual. It's essential to the safety, that the user always attach the energy absorber as high as possible above his/her position, to minimize the fall distance most possible in case of a fall.

The position of the anchor point is crucial for fall arrest – the height of the fall, elongation of lanyard and energy absorber or pendulum movement of the user should be considered in order to minimize the risk of impact in obstacles in case of a fall. It's prohibited for the user to do many modifications or use non original Avanti components when assembling AVANTI LIFT ANCHOR.

Re-use of demounted AVANTI LIFT ANCHORS or parts is not allowed. Any changes or other uses beyond this manual are strictly forbidden.

Any changes or other uses beyond this manual are strictly forbidden. This documentation must be kept in the service lift for the purpose of subsequent examinations of the anchor device.

E.2 Danger

The AVANTI LIFT ANCHOR is for the use of one person only. It is strictly forbidden to carry out work if the person is in unfit mental or physical condition. Climbing and working under the influence of alcohol, drugs or any medication which can interfere with the safety are also much prohibited.

If there are any doubts to the safety of the AVANTI LIFT ANCHOR, or it isn't proper fixed, deform or damaged with cracks or similar incompatible harms it may never be used – Please contact the manufacture immediately. In case of corrosion the anchor immediately needs to be removed.

Observations:

Only to be used by instructed workers! Instructed workers must be aware, instructed and prepared to utilize site rescue plans.

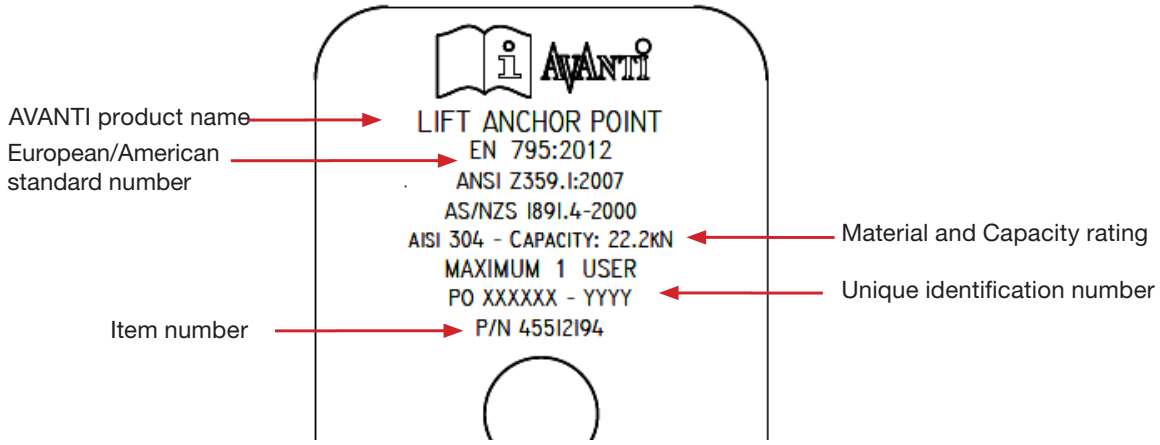
Only to be used for preventing vertical fall!

Only to be used for fall arrest, not to hoist or hang in goods or similar! Before attaching in the ANCHOR the user needs to check it is sitting fixed and screws are sitting tight and proper.

If AVANTI LIFT ANCHOR has arrested a fall it may never be used again. Part must be removed from service immediately.

E.3 Marking

Marking on Lift Anchor plate:



After installation, marking shall be completely accessible; otherwise additional marking near the anchor device will be necessary.

E.4 Installation

The installation must be performed by a competent person following the instructions of this manual.

AVANTI LIFT ANCHOR is tested and approved only to be installed on AVANTI lift. AVANTI LIFT ANCHOR made from AISI 304 Steel has to be screwed with two bolts DIN 933 A2-70 M12 mm, 4 washers DIN 125A A4 and self locking nuts DIN 985 A4 M12. In case of doubt, please contact AVANTI.

Before installing the AVANTI LIFT ANCHOR in heights, assure to be proper secured against fall from height by using relevant fall arrest equipment.

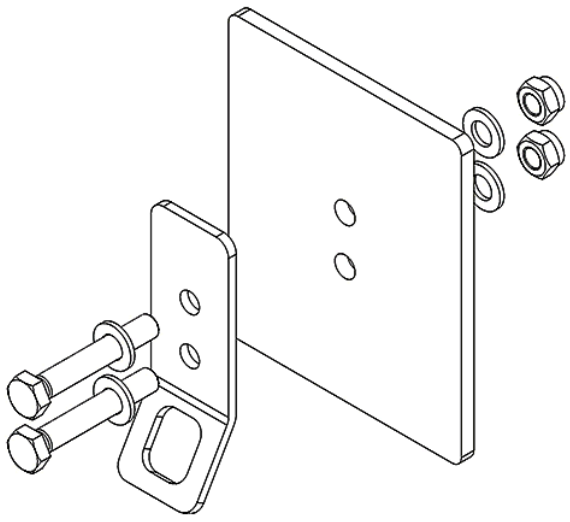
AVANTI LIFT ANCHOR:
1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.

2. Torque the nuts with 15 N·m (11 lb·ft).

3. Make sure the Anchor is fully seated and properly tightened.

4. Fill in “Installation form”.

5. Carry out yearly inspection by following the procedure in the section “Inspection”.



E.5 Inspection

After installation:
An inspection must be carried out by a competent person following the inspection form in this manual.

Before use:
Each time using the AVANTI LIFT ANCHOR the user inspects the ANCHOR visual and manually by twisting / pulling. Check the parts are properly fixed and free of deformities, damages, cracks or similar unacceptable defects.

Periodical examination:
A periodic examination at least every 12 month is essential for the safety of the AVANTI LIFT ANCHOR. The examination must be performed by a competent person following the inspection form in this manual.

For the AVANTI LIFT ANCHOR the competent person (authorized in writing by AVANTI) only needs to be trained in any metallic component covered by the European/American standard norms for fall arrest equipment.

E.6 Inspection form

PPE Anchor:	Manufacturer:	Avanti
	Type / Model:	Lift Anchor
	Identification no.:	
Fixing structure:	Lift serial no.:	
	Lift model:	
	Wind farm / WTG no.:	
Installed by:		
Installation company:		

	OK	**not OK**
1. Lift structure does not show any deterioration.		
2. Anchor locking screws are fully inserted and tightened with 15 N·m.		
3. Anchor does not show cracks, deformities, corrosion or other damages.		
4. Anchor installed on the lift structure according to the instructions.		
5. Anchor marking is clearly readable.		

Is the Anchor in good condition to be used?

Yes	Needs Repair	Replace

Signature of competent:
Name of competent in capital letters:
Date:

If the AVANTI LIFT ANCHOR is found not OK, it must be removed / replaced by a new AVANTI LIFT ANCHOR! The result of the periodic examination must be recorded in the Registration form of anchor.

E.7 Registration form of anchor

Avanti lift Anchor	Identification no.:	Avanti Wind Systems A/S DK-3400 Hillerød Tel:+45 48 24 90 24 Fax: +45 48 24 91 24 www.avanti-online.com

Date of purchase:	Date first put into service:

Periodic examination and repair history				
Date	**Reason for entry (per. exam)**	**OK / not OK**	**Inspector**	**Periodic exam next due date**

Appendix F: Service tool kit

F.1 Purpose

If optional service tool kit is provided, it is possible to perform visual inspection, repairs and service of components along the WTG, while safely riding on the top of the cabin.

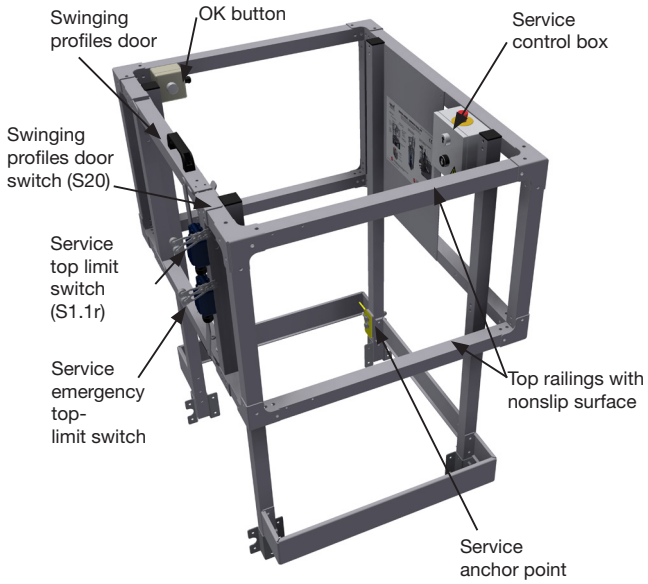
F.2 Technical specifications

Service tool kit	
Service tool kit weight	<25 kg
Service lift rated load when service tool kit installed	215 kg
Max. nº persons on service tool kit	1 person

F.3 Description

The service tool kit is an optional portable tool that allows personnel to ride on top of the service lift in order to perform installation and service tasks along the travel zone:

- During erection of WTG: installing WTG power supply and auxiliary cables running close to the lift.
- Maintenance: tightening and verifying torque of WTG flange bolts.
- Repair: replacing components which are accessible from the lift: lights, junction boxes and cables.



Service tool kit is lighter than 25 kg.

STOP *When service tool kit is installed rated load is decreased from 240 kg to 215kg!*

STOP *Top obstruction device becomes disabled when service tool kit is installed. During ascent, personnel shall constantly verify that travel zone is free of obstacles.*

When connected service control box overrides cabin control box. If it is not connected, no upwards travel is possible. Service control box does not override any safety: if any hatch, door or limit switch, or emergency stop button, is triggered, no running will be possible.

Service top limit switches override those ones on the cabin. A service top limit plate is attached to the ladder to trigger these switches.

STOP *Only one user travelling on top with service tool kit installed is allowed. Additionally, a second user inside the cabin is also allowed.*

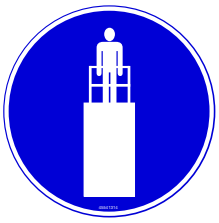
STOP *During service lift travelling, personnel shall not extend their body parts beyond the service tool kit perimeter.*

STOP *No person is allowed at platforms when service tool kit is used.*

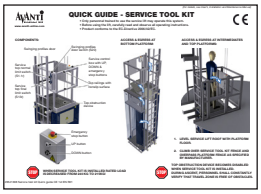
F.4 Information signs and documents

The following documents, signs and labels are supplied with the service tool kit and shall always be available.

Location	Document
Main control box	Standing on top only with service tool kit label
Service tool kit	Quick guide of service tool kit
	Electrical hazard warning label



Standing on top only with service tool kit



Service tool kit Quick guide

Electrical hazard warning label

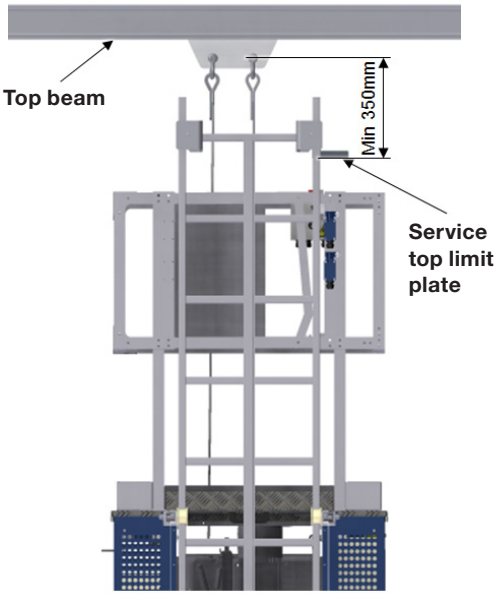
F.5 WTG integration requirements

Special attention shall be given to the integration of the service tool kit.

WTG component	General integration requirements	
Platform fences	Treatment of top surfaces of fences of intermediates and top platforms (If service tool kit is supplied).	Nonslip

F.6 Service activation plate

If service tool kit is supplied, adjust the final position of the service travel limit activation leaving at least 350 mm between plate and top beam holes for shackles.

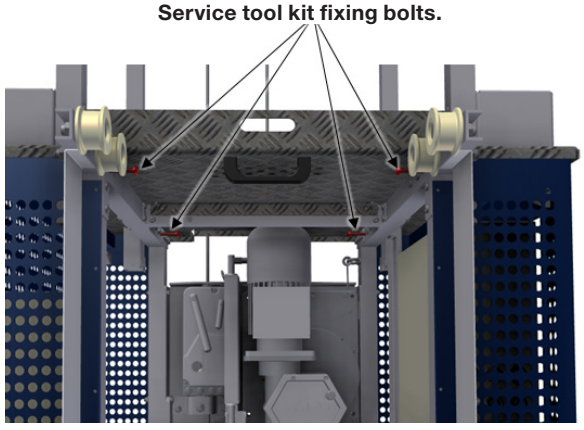


F.7 Installation

Service tool kit shall be assembled on bottom platform floor.

1. Position the preassembled structure over service lift roof.
2. Insert vertical profiles through top obstruction device holes.
3. While a first installer stands on and compresses the top obstruction device, a second installer fastens a bolt through each vertical profile.
4. Connect electrical cables to two-hand control boxes.
5. Feed them thorugh top obstruction device hole.
6. Connect them to main control box.

Service tool kit fixing bolts.



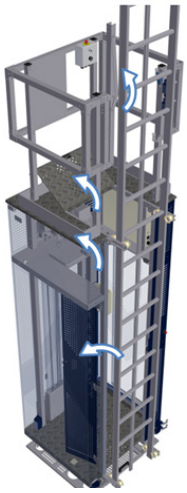
Disassembling is done in reverse order.

When standing on top of cabin, installer shall be attached to safety ladder by means of the fall arrest equipment.

Use a hand winch attachable to the ladder to safely elevate preassembled service tool kit over service lift.

F.8 Instructions for use at bottom platform

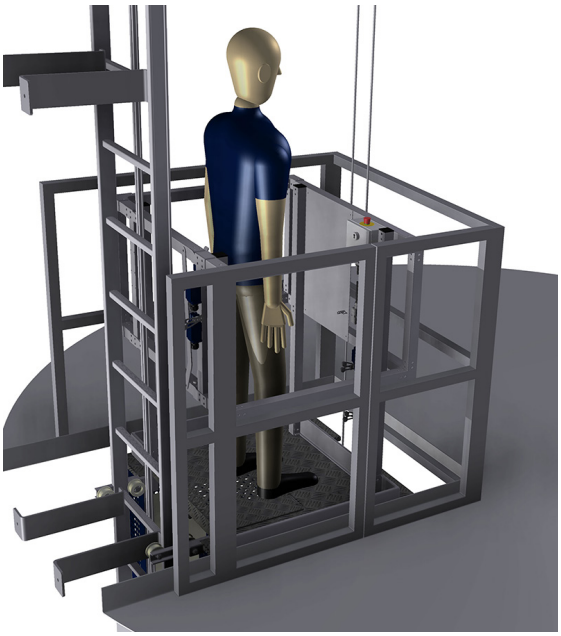
To access service tool kit from bottom platform:
1. Level service lift floor with platform floor.
2. Open ladder access door.
3. Attach slider to ladder safety rail and climb onto the ladder.
4. Open top hatches and climb through them.
5. Close ladder access door and top hatches with your foot.
6. Release slider and close swinging profiles.
7. Hook your fall arrest equipment to the service anchor point.
8. Press and hold the UP and OK buttons simultaneously (two-hand controls) to ascend.



Egress from service tool kit is done in reverse order.

F.9 Instructions for use at intermediate and top platforms

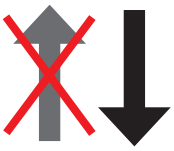
To egress to intermediate and top platforms from service tool kit:
1. Level service lift roof with platform floor.
2. Climb over service tool kit fence and overpass platform fence as specified by manufacturer.
3. Hook your fall arrest equipment to the service anchor point.
4. Press and hold the DOWN and OK buttons simultaneously (two-hand controls) to descend.Access to the service tool kit from intermediate and top platforms is done in reverse order.



F.10 Maintenance planning

Frequency	Performed by	Components
Daily	User	Control and safety devices of service tool kit (only when mounted)
Annually	Authorised person by AVANTI	Control and safety devices of service tool kit (only when mounted)

F.11 Troubleshooting

Breakdown	#	Cause	Specific cause	Solution
The service lift cannot ascend nor descend.	**A1**	Service tool kit is installed.	It overrides cabin control box.	Use service control box.
			Service emergency top limit switch (S13r) is activated.	Manually descend service lift until switch is released.
			Swinging profiles door switch (S20) is triggered.	Close door.
Service lift can descend but cannot ascend. 	**B1**	Service tool kit is installed and service top limitswitch (S1.1r) is activated.	Service lift has reached top limit.	-

F.12 Inspection checklist

1	CONTROL AND SAFETY DEVICES OF SERVICE TOOL KIT	OK	Not OK	ISSUE DESCRIPTION/ COMMENTS
1.1	Press and hold UP and OK buttons simultaneously (two-hand controls): ascent is possible (2 m).			
1.2	While triggering service top limit switch (S1.1r) lever, press and hold UP and OK buttons simultaneously: ascent is not possible.			
1.3	Press and hold DOWN and OK buttons simultaneously: descent is possible (1 m).			
1.4	While triggering service emergency top limit switch (S13r) lever, press and hold UP and OK buttons simultaneously: ascent is not possible.			
1.5	Press emergency stop button of service control box, and press and hold DOWN button: descent is not possible.			
1.6	Pull to release emergency stop button of service control box, and press and hold DOWN and OK buttons simultaneously: descent is possible (0.5 m).			
1.7	Open swinging profiles door, and press and hold DOWN and OK buttons simultaneously: descent is not possible.			
1.8	Close swinging profiles door, and press and hold DOWN and OK buttons simultaneously: descent is possible (0.5 m).			

Australia
Avanti Wind Systems PTY LTD
Unit 15 / 160 Lytton Road
Morningside 4170 · Queensland
P: +61 (0) 7 3902 1445 · F: +61 (0)7 3902 1252

China
Avanti Wind Systems
Building 4, No, 518,
Gangde Road, XiaokunshanTown
Songjiang District, 201614 Shanghai
P: +86 21 5785 8811 · F: +86 21 5785 8815

Denmark
Avanti Wind Systems A/S
Rønnevangs Allé 6 · DK-3400 Hillerød
P: +45 4824 9024 · F: +45 4824 9124

Germany
Avanti Wind Systems GmbH
Max-Planck-Str. 10 25335 Elmshorn
P: +49 (0) 41 21-7 88 85 – 0 · F: +49 (0) 41 21- 7 88 85-20

Spain
Avanti Wind Systems SL · Poligono Industrial Centrovia
Calle Los Angeles No 88 nave 1 · 50198 La Muela
P: +34 976 149524 · F: +34 976 149508

UK
Avanti Wind Systems Limited
Caldershaw Business Centre · Unit 29
Ings Lane · Rochdale · OL12 7LQ
P: +44 0 1706 356 442

USA
Avanti Wind Systems, Inc.
5150 S. Towne Drive · New Berlin · Wisconsin 53151
P: +1 (262) 641-9101 · F: +1 (262) 641-9161

India
Avanti Wind Systems India Private Ltd
Old No. 28, New No. 41 · Vellala Street,
Aiyanambakkam · Chennai 600095 · Tamil Nadu
P: +91 44 6455 5911

Brazil
Avanti Brazil Sistemas Eólicos. S.L.
Rodovia BR-116 · Km21
Fortaleza · Ceará
P: +55 85 9671 6336

I: www.avanti-online.com · E: info@avanti-online.com

45540081 – Octopus Lift manual, EN
1st CE Edition: 6/2013
Revision 3: 12/06/14